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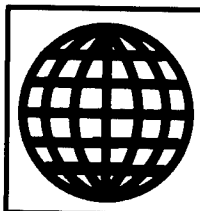

JPRS Report

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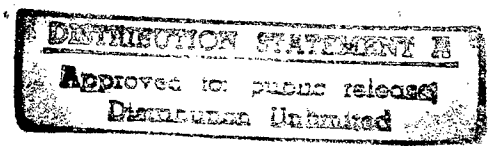

Science & Technology
USSR: Life Sciences

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UDC 629.78:612.766.2.08

370-Day Antiorthostatic Hypokinesia: Goals and Protocols

907C0422C Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 5, Sep-Oct 89 pp 47-50

[Article by A. I. Grigoryev and B. V. Morukov]

[Text] Long-duration spaceflights would be impossible without means for preventing the unfavorable influence of weightlessness upon the human body—means that would be capable of ensuring highly efficient cosmonaut performance in all phases of the mission and successful readaptation to terrestrial conditions following the mission.

The system of preventive measures used today[3,8] has made it possible for man to remain in weightlessness for up to 326 days.

However, the experience gained from long-duration spaceflights has posed a number of new problems for space medicine, and on their solution hinges the feasibility of further increasing the duration of spaceflights. The significance of changes in the musculoskeletal system, metabolism, the functional state of digestive organs, the urinary system, the red blood system, and the body's immune response increases with prolonged exposure to weightlessness.[2,7] Preventive measures directed primarily at maintaining the functional level of the cardiorespiratory system are not enough to prevent such changes: specific preventive and corrective means are needed. Adaptation of the cardiovascular system to weightlessness is also not limited to merely an acute period: problems of organ hemodynamics, microcirculation, and lymphatic circulation—which are closely associated with factors regulatory changes and with changes in organs at the tissue and cellular levels—become preeminent as the duration of spaceflight lengthens.

Any further lengthening of the duration of spaceflights would require that the system of preventive measures be made more efficient and that it be refined and supplemented. The experience that has been gained by medical support of spaceflights indicates that the time available for use of preventive means—especially physical conditioning (PC)—conflicts somewhat with the growing amount of the job-related activities of cosmonauts.

It should be noted that illnesses, the probability of which grows as the duration of a spaceflight increases, will also be an obstacle to the performance of PC; specific use of preventive and corrective means that restore the functional state of the human body in the course of spaceflight would be required during the recovery period.

Thus, the system for preventing the unfavorable effects of spaceflight factors must be more flexible, it must be integrated, and it must involved the possibility both of preventing changes and of correcting those that arise.

Strict bedrest in an antiorthostatic position is the most widespread model of weightlessness in terrestrial conditions that may be used over a lengthy period of time.[4] Joint work by researchers, physicians specializing in medical supervision, and the developers of preventive means oversee the complex of preventive measures; its refinement, individualization and supplementation; and the proper assessement of the effectiveness of various preventive systems.

The purpose of research on 370-day antiorthostatic hypokinesia was to improve the complex of preventive measures that are designed for use during long space flights.

The first objective—and a fundamental one—was to improve the PC system, which entailed:

- studying the effectiveness of various conditioning tactics
- assessing the decline in fitness after intervals of no PC for various durations of bedrest
- developing and testing systems of recovery of the body's functional level during bedrest after a lengthy interval of no PC
- testing promising simulators and equipment for the automated control of training and for medical monitoring during training

The second objective was to study the effectiveness of pharmaceutical preparations that avert metabolic changes in tissues of the locomotor system, to study metabolism, and to ensure an adequate level of energetic and plastic processes during times of intensive physical conditioning.

The third objective was to assess the effectiveness of means for day-to-day correction for hemodynamic shifts and hydro-ionic homeostasis.

Ten essentially healthy male volunteers aged 27-42 years took part in the research. They were divided into two groups of five persons each. Group 1 used a complex of preventive measures including both PC and pharmacological drugs for adjusting metabolism, the state of bone tissue, and digestive functions throughout the entire bedrest period.

In the PC, the conditioning microcycle in both groups consisted of four days (three days of physical conditioning and one day of rest). The conditioning was conducted in horizontal position on the treadmill of a Podveska unit[6] and on a bicycle ergometer hooked up to a Fiziotest instrument that controls physical conditioning on the basis of both a built-in program and pulse frequency feedback.[1] In addition, physical conditioning also included a set of exercises with expanders.

Prior to the bedrest period and twice in its course, group 1 underwent cycles of ultraviolet irradiation for the

purpose of raising the body's overall resistance and preventing vitamin D deficiency.[5]

The subjects of group 2 remained in antiorthostatic hypokinesia without the use of preventive means for 120 days, after which the functional capabilities of the body were restored with physical conditioning performed by the subjects for two months, while they remained on bedrest. After 180 days of bedrest, that group was used to test promising physical training programs and auxiliary methods that raise the effectiveness of physical conditioning and promote recovery after physical exertion.

Group 2 subjects underwent pharmacological correction after 150 days of bedrest, if there were indications for such.

In the final stage of the experiment, both groups used the most effective PC regimes and means for day-to-day correction of water-salt metabolism and hemodynamics. A Karkas bladderless partial-pressure suit,[9] water-electrolyte additives and a vitamin-protein complex were used for that purpose.

In order to increase orthostatic stability, group 2 was also subjected to ODNT [not further identified] conditioning combined with myo-electrostimulation.

The general structure of the research was based on the system of preventive measures, and the principal objective was to assess the effectiveness of the preventive means utilized at various stages of the research. The general structure of the research is shown in the table below.

General Structure of the Research

I. Cardiorespiratory system
  A. Studies at rest
    1. ECG, polycardiography, plethysmography
    2. Dynamic ECG
    3. Ultrasound studies of heart and vessels
    4. Radioisotope studies: Blood redistribution: regional and organic hemodynamics; tissue and regional lymph flow; blood filling of internal organs
    5. Tissue oxygen conditions and regional circulation by polarigraphic method
    6. Respiratory biomechanics and determination of diaphragm's reserve capacities
  B. Functional tests
    1. Tolerance of accelerations + Skh [not further identified]
    2. Posture tests
      2.1. Orthostatic test (including jointly with radioisotope studies)
      2.2. Antiorthostatic test (together with ultrasound study)
    3. Tests with physical exertion
      3.1. Maximum physical exertion test on treadmill
      3.2. Physical exertion test on bicycle ergometer: together with ultrasound studies; together with radioisotope studies; together with use of Fiziotest complex
      3.3. Physical exertion test on treadmill in recumbent position
II. Musculoskeletal system
  A. State of bone tissue
    1. Noninvasive methods
      1.1. Single-photon absorptiometry (heel, lower leg, forearm)
      1.2. Two-photon absorptiometry (spinal column, femoral neck and diaphysis)
      1.3. Computerized tomography (spinal column, femur, lower leg)
      1.4. Neutron-activation analysis of calcium content (foot, spinal column, hand)
      1.5. Ultrasound diagnosis
    2. Biopsy of the iliac crest (physicochemical properties, mineral composition, strength characteristics)
  B. Muscular system and neuromuscular apparatus
    1. Muscle speed-power properties and efficiency
      1.1. Isokinetic dynamometry (voluntary contractions)
      1.2. Isometric tendometry (induced contractions)
      1.3. Sports testing of muscle groups
    2. Anthropometry
    3. Reflexometry (T- and H-reflexes)
    4. Motor regulation (posture regulation, precise movements, activity of motor units, integral tremorography)
    5. Study of muscle biopsies (morphological, histochemical analyses)
III. Metabolism and its regulation
  A. Biochemical analyses
    1. Balance studies
    2. Biochemical analyses of blood and urine
      2.1. Blood ionic composition
      2.2. Concentration of protein, blood protein fractions, products of nitrogen metabolism in blood and urine
      2.3. Blood lipid spectrum
      2.4. Lipid peroxidation
      2.5. Metabolites of carbohydrate metabolism
      2.6. Blood enzymes
      2.7. Baseline levels of hormones and bioactive substances in blood, their excretion with urine
    3. Daily rhythms of parameters characterizing water-salt metabolism and its regulatory system
  B. Functional tests
    1. Calcium gluconate administration (peroral, intravenous) test

2. Insulin injection test
3. Glucose load test (including with analysis of hormone parameters)
4. ADH injection test
5. Analysis of biochemical parameters during physical exertion test
6. Analysis of biochemical parameters during use of day-to-day water-salt metabolism adjustment drugs
7. Analysis of biochemical parameters in response to vestibular effects

IV. Digestive system
1. Analysis of digestive enzymes in blood, stool, duodenal juice
2. Analysis of the stomach's acid-forming function (acid test, intragastric pH measurement)
3. Duodenal probe and analysis of bile acid spectrum
4. Ultrasound studies of digestive organs

V. Hematological analyses
1. Analysis of peripheral blood
2. Analysis of hemoglobin weight
3. Study of iron metabolism
3.1. Ferrotsironovaya [translation unknown] load
3.2. Radioisotope method
4. Analysis of erythrocyte metabolism

VI. Immunological analyses
1. Cellular immunity factors
2. Humoral immunity factors
3. Immunological mechanisms regulating calcium metabolism and state of bone tissue

Note: Psychophysiological, ophthalmological and hygienic examinations were conducted monthly during the experiment.

Once every two months, at the end of each of the PC regimes, a cycle of physiological tests was conducted, to include an orthostatic test, a treadmill test involving maximum physical exertion, noninvasive bone-tissue analysis, a study of the state of the muscular system and assessment of physical condition, biopsy of muscles of lower leg, biochemical blood and urine analyses, tests involving exposure of the lower half of the body to negative pressure, etc.

G-load tolerance on a centrifuge was studied on the 120th, 240th and 360th days of bedrest. Thorough examinations of cardiovascular function and hematological analyses were conducted monthly during bedrest.

The mineral balance was studied in the background period and in the entire period of bedrest, and biopsies of the iliac crest were taken at the beginning and end of bedrest and, in group 2, on the 115th day of bedrest.

The preliminary results indicate that the complex of preventive measures used during the 370-day bedrest are effective.

Bibliography

1. Baranski, S., Skibnevski, F., Sarol, Z. et al, "Soveshchaniye postoyanno deystvuyushchey gruppy sots. stran po kosmicheskoy biologii i meditsine programmy 'Interkosmos', 16-e: Tezisy" [Meeting of the Permanent Group of Socialist Countries for Space Biology and Medicine of the "Interkosmos" Program, 16th: Abstracts], Kechkemet, 1983, p 54.

2. Gazenko, O. G., KOSMICHESKAYA BIOL., No 1, 1984, pp 3-8.

3. Kakurin, L. I., Katkovskiy, B. S., Tishler, V. A. et al, Ibid., No 3, 1978, pp 20-27.

4. Kovalenko, Ye. A., Ibid., No 4, 1977, pp 3-9.

5. Panferova, N. E., bid., No 1, 1986, pp 4-12.

6. Stepantsov, V. I., Yeremin, A. V. and Tikhonov, M. A., "Nevesomost. Mediko-biologicheskiye issledovaniya" [Weightlessness. Biomedical Studies], Moscow, 1974, pp 298-314.

7. Smirnov, K. V. and Ugolev, A. M., "Kosmicheskaya gastroenterologiya: Trofologicheskiye ocherki" [Space Gastroenterology: Trophological Notes], Moscow, 1981.

8. Tishler, V. A. and Stepantsov, V. I. in Simonov, P. V. and Kasyan, I. I. (Editors), "Fiziologicheskiye issledovaniya v nevesomosti" [Physiological Research in Weightlessness], Moscow, 1983, pp 267-285.

9. Shulzhenko, Ye. B., Yarov, A. S., Koslova, V. G. et al, KOSMICHESKAYA BIOL., No 6, 1983, pp 30-33.

UDC 629.78:574.682

Matter Balance During Catalytic Oxidation of Water Admixtures by Hydrogen Peroxide

907C0422D Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 5, Sep-Oct 89 pp 75-78

[Article by I. I. Vasilenko, N. M. Shevel and Yu. Ye. Sinyak]

[Text] Creation of a closed-loop water-supply cycle is one of the principal tasks in the development of life-support systems for the crews of aerospace vehicles.[5,7,8] The catalytic oxidation method is the most versatile of the known water regeneration methods.[9] However, oxidation of water impurities with oxygen proceeds at a temperature of 150-500°C, and it involves large energy expenditures.

The possibility of achieving a high degree of water purity through liquid-phase oxidation of impurities by hydrogen peroxide in the presence of oxide and other nonmetallic catalysts was demonstrated by Vasilenko *et al.*[2,3] The end products of low-temperature oxidation of phenol and acetone by that method are water and carbon dioxide. Hydrogen and carbon become the products formed from organic compounds binding with oxygen in the oxidizer.

Catalytic decomposition of hydrogen peroxide occurs simultaneously with oxidation of impurities. Water is also formed, and oxygen is liberated, which may be used to regulate the composition of the atmosphere in sealed craft.

Obviously, the quantity of pure water in a regenerating system based on catalytic oxidation of impurities by hydrogen peroxide will increase. The carbon dioxide that is released may be recycled by known methods.[6]

In connection with the above, the ratio of gaseous products of catalytic reactions involving various concentrations of oxidizer was investigated, and the quantity of water forming in those reactions was determined. Removal of phenol from water was adopted as the model of the process.[4]

Procedures

The naturally occurring mineral siderite containing 22.3 percent Fe^{2+} by weight, pulverized to a particle size of 0.25 mm, and aqueous solutions of chemically pure phenol and hydrogen peroxide were used, with the total volume of the liquid phase being 10-20 ml. Oxidation was carried out with solutions having an initial temperature of 20-22°C; magnetic stirring was employed. The kinetics of the catalytic processes were monitored on the basis of the volume of oxygen and carbon dioxide released.[4] The degree of phenol conversion was determined from the equation $\alpha = (CO_2)/(CO_2)_T$, where (CO_2) is the volume of carbon dioxide released by oxidation of phenol and corrected to normal conditions, and $(CO_2)_T$ is the theoretical volume, corresponding to complete oxidation of phenol in the conditions of the experiment.

Results and Discussion

It was established that the rate of the overall process of phenol oxidation is proportional to the concentration of the oxidizer, with the order of the partial catalytic reactions being different. Oxidation of phenol down to carbon dioxide proceeds as a second-order reaction, while the rate of oxygen release is described by the equation

$$V_{O_2} = k_1 [H_2O_2]^{1,46}.$$

Complete oxidation of 0.05 M C_6H_5OH in the conditions of the experiments required an oxidizer content of 0.7 M H_2O_2. Therefore, with 0.5 M H_2O_2, the CO_2/O_2 ratio in the mixture of released gases is only 12.8 percent after 30 min. As the concentration of the oxidizer increases, the value of CO_2/O_2 rises substantially, in correspondence with the orders of the partial catalytic reactions noted in Table 1.

Table 1. Effect of Hydrogen Peroxide Concentration on the Ratio of Gaseous Products and Oxidizer Consumption (0.05 M phenol, 0.5 g siderite, 20°C)

Initial H_2O_2 Concentration, moles/liter	CO_2/O_2 Ratio, % by volume	Proportion of Catalytically Decomposed Hydrogen Peroxide, %
0.5	12.8	39.2
0.7	38.3	46.3
1.0	40.4	48.6
1.5	61.9	46.7
2.0	87.2	46.6
2.5	—	48.0

The order of the reaction in which carbon dioxide is formed is 0.544-0.558 in relation to the phenol concentration after 30 minutes of oxidation, while it is close to 2 in relation to catalyst content in the presence of 0.25-0.75 g siderite. In light of the established dependencies, the overall equation for the kinetics of carbon dioxide release may be written in the following form:

$$V_{CO_2} = k_2 [C_6H_5OH]^{0,55} [H_2O_2]^2 [Fe^{2+}]^2.$$

Using the volume of oxygen released, we find the proportion of hydrogen peroxide expended in catalytic decomposition in the reaction $2H_2O_2=2H_2O+O_2$. Based on water vapor pressure, temperature and atmospheric pressure, it was established that, given an initial H_2O_2 concentration of 0.7-2.5 M, a range of 46.3-48.6 percent of the oxidizer is expended through catalytic decomposition in relation to 0.5 g siderite in 40 min (see Table 1).

It should be noted that as the siderite concentration is increased from 0.5 g to 0.75 g to 1 g, the relative proportion of catalytically decomposed hydrogen peroxide also rises, assuming values of 48.2 percent, 56.8 percent and 64.5 percent. We find from the quantity of carbon dioxide released that for 1 g of siderite, 42.3 percent of the oxidizer introduced into the system was utilized in 30 minutes to oxidize phenol. Then the total quantity of expended hydrogen peroxide exceeds its total initial concentration in solution by 6.8 percent. The degree of conversion of phenol into CO_2, which is found by the method indicated above, is also more than 100 percent in some cases (Table 2, numerator).

Degree of Conversion of Phenol into Carbon Dioxide (0.05 M phenol, 0.5 g siderite, 21°C)

	Hydrogen Peroxide Concentration, moles/liter				
Oxidation Time, min	0.5	0.7	1.0	1.5	2.0
15	2.56	5.04	6.1	6.95/7.0	22.6/22.5
20	2.94	12.1	15.4	22.8/22.6	56.5/54.3
25	4.45	16.9	21.2	40.4/38.2	91.1/80
30	5.0	18.9	26.9	55.8/49.0	113.0/92.5
35	5.93	20.2	29.6	65.2/53.5	130.5/99.8

Siderite contains iron (2+) in hydroxocarbonate form, which may serve as an additional source of carbon dioxide and as a factor inflating the values of the degree of phenol conversion. The initial pH of the aqueous solution consisting of phenol and hydrogen peroxide is 5.4-5.7, and the pH reaches a minimum value of 1.81 in the course of phenol oxidation. In this connection we studied release of CO_2 and O_2 in the system under analysis in the absence of phenol at pH values from 5.4 to 1.7, adjusted by the addition of HCl.

The rate of oxygen release in the H_2O-H_2O_2-HCl-siderite system is shown in Figure 1, and it is consistent with general ideas concerning retardation of heterogeneous-catalytic decomposition of hydrogen peroxide in the presence of acids.[1]

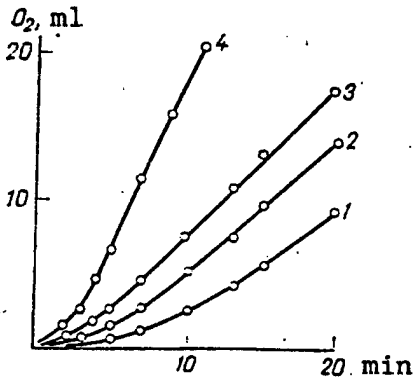

Figure 1. Kinetics of Oxygen Release in the H_2O-HCl-H_2O_2-Siderite System: 1,2,3,4—solution pH values of 1.7, 2.02, 2.54 and 3.0 in the presence of 1.5 M H_2O_2 and 0.5 g siderite.

Analyzing the kinetics of carbon dioxide release in the absence of phenol, we should note that at pH $\geq$ 1.8, CO_2 is not released from an H_2O-HCl-siderite system for 20 min. Consequently, the catalyst is not broken down by hydrochloric acid, and it does not contain other carbonate impurities that are broken down by strong acids in the indicated conditions. Release of carbon dioxide is observed only with the addition of hydrogen peroxide, and at pH values not greater than 3.0 (Figure 2). That feature is probably associated with transition of iron (2+) to Fe^{3+} in response to the addition of hydrogen peroxide; that ferric iron is then partially extracted by the acid, with the release of CO_2 from siderite. Conjugated redox reactions between Fe^{3+} (Fe^{3+}) [sic] and H_2O_2 are also a source of radicals contributing to the high oxidizability of such systems.[10,11]

Gasometric studies also made it possible to determine the true degree of phenol conversion during catalytic

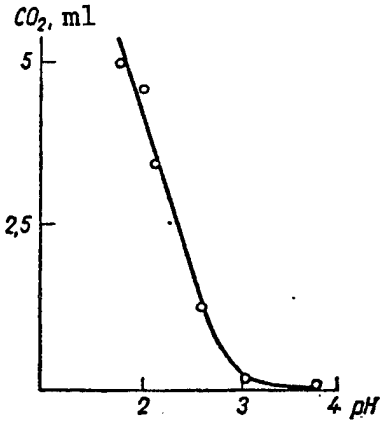

Figure 2. Effect of pH on Release of Carbon Dioxide in the H_2O-HCl-H_2O_2-Siderite System: Content of components—1.5 M H_2O_2 and 0.5 g siderite; reaction time—30 min.

oxidation on siderite. In particular, based on the correction for the volume of CO_2 released from the catalyst, the value of α is 92.5 percent and 99.8 percent after 30 and 35 min in the case of 2 M H_2O_2 and 0.05 M C_6H_5OH (see Table 2, denominator).

In correspondence with the reaction $C_6H_5OH + 14H_2O_2 = 6CO_2 + 17H_2O$, when 1 liter of water containing 0.05 M C_6H_5OH is purified, an additional 15.3 g of H_2O are formed. It is evident from Table 1 that in this case an average of 47.2 percent of the oxidizer is decomposed catalytically, which, given an initial H_2O_2 concentration of 1.5 M, is 0.708 moles of hydrogen peroxide and which corresponds to 12.7 g of formed water. Thus, the total quantity of additionally formed water is 28 g per liter of regenerated water containing phenol.

In the conditions of space flight, the daily output is around 2 liters of fluids per individual. The average content of organic impurities in those fluids, based on the chemical consumption of oxygen, is roughly equivalent to 0.05 M phenol. Consequently, when those products are purified by the proposed catalytic oxidative method, the chemical reactions form an additional 204.4 kg of water per year. On long flights, the volume of moisture-containing fluid products increases, as does the quantity of pure water that is formed.

For stricter calculation of the yield of carbon dioxide and oxygen, it would be suitable to use the real values of chemical consumption of oxygen in specific human fluid products and in wastes from biotechnical systems. When we assess the quantity of additionally formed water, we also need to account for water obtained as a result of hydrogenation of carbon dioxide in the Sabatier reaction $CO_2 + 4H_2 = CH_4 + 2H_2O$.

Thus, the proposed water regeneration method makes it possible to transform various organic substances unsuitable for further direct use into water and carbon dioxide, which can be recycled. That precludes the need for extracting water from hard-to-process wastes, while allowing for its complete recycling in the life-support systems of self-contained sealed craft.

Bibliography

1. Vasilenko, I. I., ZHURN. FIZ. KHIMII, Vol 53, No 11, 1979, p 2817.

2. Vasilenko, I. I., Fedosova, A. N. and Shevel, N. M., ZHURN. PRIKLAD. KHIMII, Vol 60, No 4, 1987, p 870.

3. Vasilenko, I. I., Shevel, N. M. and Sinyak, Yu. Ye., KOSMICHESKAYA BIOL., No 1, 1988, p 78.

4. Vasilenko, I. I., Fedosova, A. N., Shevel, N. M. and Sinyak, Yu. Ye., Ibid..

5. Voronin, G. I. and Polivoda, A. I., "Zhizneobespecheniye ekipazhey kosmicheskikh korabley" [Spacecraft Crew Life Support], Moscow, 1967.

6. Grishayenkov, B. G., "Osnovy kosmicheskoy biologii i meditsiny" [Principles of Space Biology and Medicine], Moscow, Vol 3, 1975, pp 70-121.

7. Malozemov, V. V., Rozhnov, V. F. and Pravetskiy, V. N., "Sistemy zhizneobespecheniya ekipazhey letatelnykh apparatov" [Life Support Systems for Aircraft], Moscow, 1986.

8. Serebryakov, V. N., "Osnovy proyektirovaniya sistem zhizneobespecheniya ekipazhey kosmicheskikh letatelnykh apparatov" [Principles of Designing Spacecraft Crew Life-Support Systems], Moscow, 1983.

9. Chizhov, S. V. and Sinyak, Yu. Ye., "Vodoobespecheniye ekipazhey kosmicheskikh korabley" [Water Supply for Spacecraft Crews], Moscow, 1973.

10. Walling, C., ACCOUNTS CHEM. RES., Vol 8, No 4, 1975, p 125.

11. Richter, H. W. and Waddel, W. H., J. AMER. CHEM. SOC., Vol 104, No 17, 1982, p 4630.

Intensive Technology Program in RSFSR

907C0398 Moscow ZASHCHITA RASTENIY in Russian No 11, Nov 89 pp 3-6

[Article by Yuriy Borisovich Shurovenkov, director of the All-Union Scientific Research Institute of Plant Protection, under the rubric "Reserves for Acceleration": "Science for Production"; first two paragraphs are biographical sketch of Yu. B. Shurovenkov]

[Text] **Yu. B. Shurovenkov is the director of the All-Russian Scientific Research Institute of Plant Protection. He is considered a distinguished authority not only by scientists, but also by agricultural specialists. The institute—which he has headed for more than 15 years—has done much in terms of theoretical science and practical applications. Scientific research has become considerably more sophisticated, and a number of new, effective methods to protect plants—primarily, intensive technologies—have been developed and refined. Yuriy Borisovich personally heads the research that is being done on cereal-crop resistance to pests and on agricultural technology.**

After graduating from the Kurgan Agricultural Institute, Shurovenko worked as the chief agronomist for an interrayon group for plant protection, he worked at an oblast experimental station, and he headed the plant protection department of the Severnyy Zauralye Scientific Research Institute of Agriculture. He successfully defended his dissertation. Since 1973, he has been the director of the All-Russian Scientific Research Institute of Plant Protection. Yuriy Borisovich Shurovenkov is a member of the bureau of the Ramonskiy Rayon Committee of the CPSU, a deputy of the rayon Council of People's Deputies, a member of the presidium of the scientific-technical council of the RSFSR Gosagroporm and of the State Chemical Commission, and a member of the editorial board of the journal ZASHCHITA RASTENIY. For his outstanding work in science and industry, Shurovenko has been awarded the Badge of Honor and other medals. Recently, Shurovenkov turned 50 years of age.

In the refinement of intensive technologies for the cultivation of cereal crops and other crops, a large role is played by the development of an integrated system to protect crops from pests, diseases and weeds; seed preparation; effective use of mineral and organic fertilizers; and proper tilling of the soil. Research in those areas is being done at 24 science facilities in the Russian Federation.

A great deal of that work is being done at the All-Russian Scientific Research Institute of Plant Protection. The institute is refining techniques for the health evaluation of young crops for the purpose compiling annual tables that concern the spread and growth of harmful organisms and a forecast of those organisms. Sample tables have been prepared for 52 such organisms, including both polyphagous pests and those prevalent on cereal crops. The institute continues to identify factors that affect the population dynamics of the grain beetle, as well as predictors for annual and short-term forecasts of the pest in the Krasnodarskiy Kray and the Voronezh Oblast.

An automated system for the collection, transmission, and processing of information on the health of young crops has been tested in experimental production conditions. Coded data was sent by teletype or telephone from 32 rayons of the Voronezh Oblast on a weekly basis. After the data were processed on an SM-1630 computer, they were used to make forecasts. A plan has been developed for the use of that system in the plant protection service.

One of the most promising areas in plant protection is breeding for resistance to disease and pests. That kind of work is being done at facilities such as the Dokuchaev Scientific Research Institute of Agriculture of the Central Chernozem Belt, the Elita Povolzhya Scientific Production Association, the Kubanzerno Scientific Production Association, the Don Scientific Production Association, and the Kuybyshev Scientific Research Institute of Agriculture. Breeding material is evaluated, and sources resistant to brown rust, mildew, and kernel smut are selected. The Elita Povolzhya Scientific Production Association has singled out varieties resistant to the Swedish fly and varieties showing signs of being resistant to the wheat sawfly. The Orel Scientific Production Association of Leguminous and Groat Crops has evaluated the resistance of varieties of millet strains to smut, banded bacteriosis, and melanosis. The Scientific Research Institute of Potato Farming and the Kuybyshev Scientific Research Institute of Agriculture have evaluated the resistance of potato varieties to alternariosis, late blight, and viral and mycoplasma diseases.

Since 1985, the All-Russian Scientific Research Institute of Plant Protection has been engaged in identifying potato varieties resistant to golden nematode, and three varieties with that trait have been found—Kardinal, Belorusskiy 3 and Prigozhiy. The institute established that the cultivation of nematode-resistant varieties, in conjunction with the use of nematicides, enables a twofold increase in harvest. As a result of the joint work conducted by the All-Russian Scientific Research Institute of Plant Protection and breeders from the Voronezh Vegetable Experimental Station of the Scientific Research Institute of Vegetable Farming, three tomato varieties have been developed and sent for state testing. Those varieties—Galzinit, Zapovednyy and Molniya—are better than the standard varieties in terms of resistance to black bacterial spot and phytophthora infection and are promising in terms of economic feasibility. Some 4,500-5,400 rubles per hectare are expected to be saved from the use of the new varieties.

With today's intensive chemicalization, which is so destructive to natural entomophages, laboratory breeding and dispersing of parasitic and predatory arthropods becomes very important. The Voronezh Biological Factory has tested an experimental prototype of a unit for collecting butterflies of the grain moth and a unit

for disinfesting grain of parasites and predators. The tests showed the new technologies to be fivefold less labor-intensive than standard technologies, and production areas where the grain becomes contaminated are reduced fourfold, with the survival rate of the caterpillars of the phytophagan at 89-94 percent.

A mock-up of a cartridge for producing trichogramma has been produced. Solutions and extracts of kairomon of the cabbageworm were chosen to increase the effectiveness of egg contamination in the unit. The suggested method of using different ages of trichogramma against each generation of pest decreases the the number of expulsions twofold, instead of multiple expulsions within 5-7 days, and the egg infection times are increased to 17 days from 7.

Studies have shown that it is possible to use trichogramma in conjunction with biological preparations in appropriate concentrations and at suitable temperatures. A device developed by the All-Russian Scientific Research Institute of Plant Protection was used at the Donskoy Sovkhoz, which is located in the Ramonskiy Rayon of Voronezh Oblast, in industrial tests of the joint and separate use of biopreparations and tricogramma to combat pests that eat cabbage leaves. The joint use of the preparations and tricogramma was more effective than the use of BTB [not further expanded], lepidoside or dendrobacillin alone by 5.6 percent, 13.4 percent and 32.2 percent, respectively. A savings of 14,500 rubles was realized by using trichogramma and biopreparations in combination on 700 hectares of cabbage and sugar beets at the Krasnyy Oktyabr Kolkhoz located in Belgorodskiy Rayon.

A technology has been refined for breeding and using aphidiide [afidiid] on pepper against the green peach aphid when the soil is protected. The Sovetskiy Sovkhoz farm conducted industrial testing of the method on 6,000 square meters. The biological effectiveness was 98 percent, and revenues were at 8,600 rubles.

The All-Russian Scientific Research Institute of Plant Protection is searching for analogs of sex pheromones and is developing practical ways to use them in gardens and on vegetable and leguminous crops. Biologically active substances such as alsistin, dimilin and insegar have proved highly effective in controlling codling and pear moths. In industrial tests, a single treatment with those substances produced the very same biological effect as did treatment with phozalone [fozalon] twice in a dosage of 3 kg/hectare. The percentage of fruit damaged by codling moths was reduced from 5.1 percent (in the control) to 1.4-1.8 percent. At the Sadovyy Sovkhoz in the Liskinskiy Rayon of Voronezh Oblast, pheromone traps were introduced on 1,047 hectares of a fruit orchard as part of a combined protection program against the codling moth. The annual savings were 49,100 rubles. Field tests of alsistin on cabbage in dosages of 100, 200 and 400 g/hectare showed that a single treatment with the substance is 83-90 percent effective against cabbage white butterflies. The All-Russian Scientific Research Institute of Plant Protection through Biological Methods has synthesized attractants which are highly effective and species-specific for the male cabbage moth.

Field screening of preparation forms of pheromones manufactured by the Tartu University has identified a number of promising attractants for use in traps to regulate a number of species of garden leaf-rollers, moths, cut-worms, pea moths, alfalfa moths, clover moths, and the cabbage moth. A special experiment proved that it is possible to use pheromone traps to map out orchards based upon the population levels of garden leaf-rollers and moths. A high correlation was found between the trapping of males and the number of larva when one trap was placed on every 10 hectares.

When four different designs of pheromone trap were tested, the open, double-laminated, corrugated-shell design by the All-Russian Scientific Research Institute for Plant Protection was found to be simpler, more effective, more reliable, and less expensive than the standard (Atrakon K).

Based upon the results of the research, a set of recommendations was jointly drafted with the All-Union Scientific Research Institute of Plant Protection—"The Use of Biologically Active Substances on Fruit and Vegetable Crops."

Some of the research focused on identifying the most effective preparations, mixtures, methods and number of applications, with due regard for environmental protection requirements. Science facilities in the region are improving a chemical protection system designed in order to minimize costs. Savings are realized through the use of less expensive pesticides and vat mixtures and cutting back chemical treatments as the hazard threshold is approached.

The compatibility and biological effectiveness of complex mixtures have been studied. According to the findings of the All-Russian Scientific Research Institute of Plant Protection, mixtures with two or more components are no less effective than preparations that are used alone, and phytotoxicity does not exceed 3 percent. Mixtures with tilt or bayleton suppress septoria leaf spot, helminthosporiosis, and powdery mildew. Adding dialen to those mixtures reduces the amount of weeds by 63-80 percent by harvest. These mixtures are recommended for industrial use in the Central Chernozem Region. The effectiveness of vat mixtures in various combinations is being studied by the Kubanzerno, Elita Povolzhya, Don, and Orel scientific production associations (on leguminous crops), the Bashkir Agricultural Scientific Research Institute, the All-Union Scientific Research Institute of Agricultural Land Reclamation, and the Bashkir and Penza Agricultural Institutes.

Ways to protect potatoes from a whole series of diseases are being developed at a number of institutions, including the All-Russian Scientific Research Institute of

Plant Protection, the Scientific Research Institute of Potato Farming, the Kuybyshev Scientific Research Institute of Agriculture, the All-Union Scientific Research Institute for the Agricultural Use of Reclaimed Lands, and the Penza Agricultural Institute. Combined and systemic fungicides have been tested against late blight, and seed disinfectants have been tested to combat disease while potatoes are being stored. It was deemed advisable to reduce the standard amount of decis [detsis] that is applied to protect potatoes from the Colorado potato beetle. The dosage should be reduced from 0.3 l/hectare to 0.2-0.15. Vat mixtures of decis and volaton with polycarbacin [polikarbatsin] and polyhom [polikhom] are recommended for industrial use to protect potatoes from the Colorado beetle and late blight.

A lot of attention is being given to the development of measures to control weeds. The most effective herbicides have been identified, as well as herbicide mixtures and how to use them on young crops of corn, barley, winter wheat and millet. Standards and timetables for applying preparations have been determined in order to correspond with the phases of plant growth. Improved methods to control offshoot weeds are being integrated into the system of fundamental soil tillage. At the Ilich Kalacheev Rayon kolkhoz in the Voronezh Oblast, the use of roundup [raundap] and lontrel [lontrel] has produced large savings in the system of soil tillage.

The effect of herbicides on the production quality of grain is being researched, as well as its effect on the raw protein content in millet and barley grain and the nitrate content in the soil. The effects of herbicides that are applied to the soil corn grows in (acetal, lasso, sual, and miazine) on the general biological activity of the soil and the processes of mineralization are being studied. Whether they have a marked influence on those processes has not been established. It has been discovered that betanal and nabu, used on sugar beets growing in soils treated with the herbicides trichloracetate, and eptam reduce the amount of nitrate build-up.

Another important problem involves the development of mechanized equipment that will use less pesticides, reduce labor, and improve sanitary and hygienic conditions. The employees of the mechanization laboratory of the All-Russian Scientific Research Institute of Plant Protection are making a large contribution to the solution of those problems. For example, the technology for disinfection, storage and transportation of seeds to the loader of the sowing machine in soft polyethylene containers has been improved. At the Pobeda collective farm, a seed disinfection production line has been installed. It handles 15 tons/hour and has resulted in a labor reduction of 60 percent.

A feasibility study has been completed for a mechanized line for a permanent station to prepare work solutions, including mixtures of pesticide and mineral fertilizers, and commercial operation of this line has already begun. The Bolsheverey solution unit services seven kolkhozes in the Ramonskiy Rayon that have more than 30,000 hectares under cultivation.

Equipment has been manufactured for a sprayer that ensures more accurate dosing of pesticides. A stand for the individual aiming of sprayers and dusters has been tested. Industrial testing of those devices on farms in the oblast showed that sprayer efficiency can be increased by 20-25 percent and—what is no less important from an ecological standpoint—pesticide application can be improved merely by using an efficient sprayer technology and by correctly adjusting and regulating the machinery.

Since 1987, the All-Russian Scientific Research Institute of Plant Protection has had an experimental design bureau with an experimental production enterprise operating on a cost-accounting basis. The function of the bureau is to prepare technical manuals and service-and-maintenance documentation for completed units, to manufacture experimental and pilot models of installations, machinery and equipment and to see that those units make it into agriculture.

One very important aspect of the integrated plant protection system is the regulation of the population dynamics of harmful insects in the agricultural ecology production system through the use of a range of agrotechnical, chemical and biological measures. That can also be seen in the research of a number of scientific institutions.

The population dynamics of primary pests and useful insects have been studied among young cereal crops in the central rayons of the Voronezh Oblast as a function of what was planted before, the sowing timetables, stand density, varieties, proximity to the forest belt, and other factors. The Rossiya kolkhoz in the Ramonskiy Rayon was able to reduce the volume of chemical treatment on 500 hectares and to save 10,600 rubles in one year by using economic hazard thresholds and forecast data.

Studies of how damage to winter wheat grain by harmful snails influences the quality of gluten showed that the economic hazard threshold of the larvae of that species during the milky ripeness stage can be raised to 2-3 specimens per square meter on young strong, high-quality wheat, and to 5-6 on row crops. A link has been established between the appearance of beetles and moth larvae and the phases of development of cereal crops; also determined is the relationship between harvest losses and number of larvae, degree of damage to leaf surface, and weather conditions.

The effect of agrotechnical techniques and the ecology on the harmfulness of various pests is being studied at the Dokuchayev Scientific Research Institute of Agriculture of the Central Chernozem Belt, at the Kubanzerno, Niva Stavropolya, and Elita Povolozhya scientific production associations, at the Orel Scientific Production Association for Leguminous and Groat Crops, at the Bashkir Scientific Research Institute of Farming and

Breeding, and at the Penza Gorky, and Bashkir agricultural institutes. The All-Union Scientific Research Institute of Farming and Soil Erosion Protection has developed a model for the protection of plants from pests and diseases for farms in the Central Chernozem Region that includes a list of pests, links between their appearance and plant growth phases, crucial periods of hazard, and the choice of control measures for each situation.

The All-Russian Scientific Research Institute of Plant Protection is conducting research to improve the methods for diagnosing diseases in seeds of cereal crops in the post-harvest period. Fungi and bacteria that damage seeds of winter wheat in the Central Chernozem Region have been identified. The coefficient of harmfulness of a complex of bacterioses is 55-60 percent on winter wheat and 35-40 percent on spring wheat. A link has been established between smaller harvests of spring wheat and infection of seed material with bacterioses.

A number of studies have been devoted to the effect of mineral feeding on the growth of disease and pests. Those studies have found the optimal combination of mineral fertilizers at which diseases in winter wheat are more weakly manifested. Experiments have shown that spaced applications of hydrogen fertilizer (root and non-root applications during the vegetation period) promoted increased development of brown rust (5.5 percent) and septoria (10 percent). When high doses of nitrogen (N_{120} and N_{200}) are introduced, increased development of head blight was noted.

Most of the research completed by scientific institutions in the region finds application in agricultural production. Last year, for example, the All-Russian Scientific Research Institute of Plant Protection made 22 proposals that were recommended for adoption. The proposals has undergone industrial testing on farms in oblasts such as Voronezh Oblast. With each passing year, scientific research becomes more organically interwoven with the production activities of kolkhozes and sovkhozes. In 1988, technology introduced by the Institute into agriculture through contracts accounted for 188,300 rubles. Many of the technologies have produced great savings. For example, the use of mechanized technology on farms in the Voronezh Oblast to disperse trichogramma over 24,300 hectares of sugar beets and peas made it possible to reduce the labor expended by 96 percent, thereby bringing a profit of 658,300 rubles. At the Druzhba Sovkhoz, located in the Lipetsk Oblast, biologically active preparations were used against leaf eating pests on 500 hectares of cabbage crop. The profits were 72,000 rubles.

However, in the researcher conducted in a number of scientific institutions, the issues studied do not always correspond to the needs of agricultural production. Many researchers continue to work on refining and perfecting current methods and standards of use of chemical preparations without the proper scientific basis for their positions in the use of pesticides. A number of relevant issues remain on the wayside. Not enough attention has been focused on developing biological protection methods, especially those used during irrigation, or on studying biocoenotic factors that cause "outbreaks" of individual pests and diseases. One of the reasons for that situation is, in our view, that there are so few plant protection subdivisions. With agricultural production being intensified, the need to deal with such issues is growing, but the number of personnel involved in plant protection at scientific research institutes is declining. Moreover, in several regional institutes (the Orenburg, Yuzhno-Ural institutes and others), no research is being conducted on plant protection. The lack of coordination of this scientific work is disturbing. There are separate recommendations being made for the very same problem, and, as a rule, they do not end up as part of integrated efforts.

A new way or organizing science deserves attention—the establishment of sector science complexes (independent of departmental authority) that work in the principal areas of development of agroindustrial production.

The transition to cost accounting and self-financing has made one issue more controversial—the conduct of scientific research that is the basis for the solution of practical problems, but that cannot produce a quick return. Even now, it is not clear who will finance research to develop standards, to test pesticides (especially foreign ones), to develop ways to measure pesticide residues in the biosphere, or to create instruments and machinery.

We must put some order in the hierarchy of authority among science institutions. Difficult situations often arise at the present time. For example, the main customer of the All-Russian Scientific Research Institute for Plant Protection is the Rosselkhozkhimiya. However, that firm has no money. The money is paid by the main administration of science. And often, it turns out that what the plant protection administration approves, the main administration rejects, based upon its own considerations. We are tortured with endless preparation of reports and requisitions and authorizations and so forth. One form is replaced by another, which cancels the contents of the first. We must put an end to this practice as quickly as possible before we lose personnel, and before science becomes an accomplice in dislodging revenues. A key role should be given to the council of the sector science complex for plant protection. The intellectual potential of agrarian science must be focused on solving the fundamental problems of agricultural production.

UDC 576.858.8:632.3.07:635.48

Resistance of Species and Varieties of Tobacco Carrying the N Gene to Tobacco Mosaic Virus

907c0371 Moscow BIOLOGICHESKIYE NAUKI in Russian No 10, Oct 89 (Manuscript received 3 Sep 88) pp 32-36

[Article by V. A. Shmyglya, S. Yunis, L. V. Bolshakova]

[Abstract] Currently held notions that supersensitivity is a type of viral resistance in plants are based on the work of Holmes. An axiom of that theory that specimens that are supersensitive to tobacco mosaic virus (TMV) cannot be systemically infected with the virus at normal temperatures (30°C or under) because the transport of the virus is completely blocked in the living cells that surround the necrosis appears to have been contradicted over the years by reports of the transport of TMV in supersensitive forms of Nicotiana at normal temperatures. The researchers here sought to confirm their own hypothesis that the reason that systemic infection with TMV in the mechanical inoculation of leaves of supersensitive plant forms is generally not found is that other functions of the virus that follow transport in the infection process are suppressed. In the experiment, the leaves of N. glutinosa and of Xanthi nc., Samsun NN, and Immunyy 580 varieties of N. tabacum were inoculated mechanically with TMV. Some 3-5 days after inoculation, typical local necroses formed. Sandwich EIA and inoculation of separate leaves of N. glutinosa and Xanthi nc. were used to identify TMV in uninoculated parts of the leaves. Tissue transplantation to removed tobacco leaves was used to isolate TMV from the leaf stalks and ribs of both the inoculated and uninoculated leaves. Seven, 15, and 30 days after inoculation, V-shaped fragments of the stalks and ribs of the inoculated plants were inserted into a T-shaped incision of the rib of Nicotiana debneyi Domin. leaves. Uninoculated tissue transplants and leaves without transplantation were used as controls. TMV levels were found to be higher in the sap of the uninoculated parts of the inoculated leaves of Xanthi nc. than in the healthy control. However, infection was absent in the sap of those parts on the indicator plant leaves, possibly because EIA detects only the free viral antigen that is completely noninfectious or the intermediate viral replication products that are noninfectious in the sap, but may become infectious by other routes. TMV was found via tissue transplantation in the stalks and ribs of the inoculated leaves after 15 days and in neighboring stalks and ribs after 15-30 days. Although the sap remained uninfected during the experiment and in the subsequent growth periods, TMV may have been present in a form that was uninfectious in the sap, but potentially infectious when transplanted to leaves of systemically susceptible plants. The researchers suspect that the experiment merely reflects an incomplete infection process in which the formation of mature viral particles are absent. They were able to identify the virus with EIA and with tissue transplantation to susceptible species. The main reason for the suppression of the formation of mature viral particles apparently consists in temperature-dependent endogenic protective reactions of the host plant. The development of TMV infection in the supersensitive forms of Nicotiana suggests to the researchers that infectious processes of that type may be found for other types of viruses that affect higher plants. The likelihood, they feel, should be kept in mind in the diagnosis of infection and in evaluations of viral resistance among selection specimens. References 10: 4 Russian, 6 Western.

UDC 632.937.15;576:858.77;632.38;633.51;663.1

Effectiveness of Virus Preparations For Control of Cotton Moths on Tomatoes

907C0463A Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR: SERIYA BIOLOGICHESKIKH NAUK in Russian No 5, Sep-Oct 89 pp 23-29

[Article by V. I. Mayorov, S. G. Spasova, R. Annayev et al.; All-Union Scientific Research Institute of Molecular Biology, NPO "Vektor", USSR Ministry of Medical and Biological Industry, Institute of Zoology, Turkmen SSR Academy of Sciences, Kolkhoz "40th Anniversary of the TSSR", Ashkhabad Rayon]

[Abstract] Tests conducted in 1986-1988 on "40th Anniversary of the TSSR" kolkhoz in Ashkhabad Rayon, Turkmen SSR on Belyy Naliv, Bezmein-3 and Novnika varieties of tomato assessing the possibility of using experimental samples of virus preparations to control the cotton moth in Central Asia and determining the effect of different factors (dose, number of applications, expenditure of working fluid, drop size, addition of food stimulators) on their biological effectiveness used virus preparations developed at the All-Union Scientific Institute of Molecular Biology of the Ministry of Medical and Biological Industry based on nuclear polyhedrosis virus of the cotton moth, isolated in Southern Tadzhikistan. Processing of experimental and control plots included application of entomophages Trichogrammatidae (50,000 per hectare) and Gabrobrakona (500 per hectare). When cotton moths were quite numerous, use of only one of the entomophages did not protect the tomatoes adequately. Two-fold and three-fold treatment with the virus preparations every 3-5 days at a virus dose of $6\text{-}15 \times 10^{11}$ polyhedrons per hectare combined with the entomophages provided good protection of the tomatoes. The effectiveness of the virus preparation increased greatly with an increase of the virus dose. The effect of expenditure of working liquid and saccharose depended upon the form of the preparation. Figures 4; references 3 (Russian).

UDC 547.724.3

Synthesis and Effect of Unsaturated γ-Lactones With Thiazole Fragments on Growth and Development of Vegetable Crops

907C0469 Yerevan BIOLOGICHESKIY ZHURNAL ARMENII in Russian Vol 42 No 9-10, Sep-Oct 89 (manuscript received 23 Nov 88) pp 956-969

[A. A. Avetisyan, G. S. Melikyan, and S. A. Sogomonyan, Yerevan State University, Department of Organic Chemistry, Department of Genetics and Cytology]

[Abstract] The effect of pre-sowing treatment of vegetable seeds with synthesized compounds on the germination and sprouting energy of the seeds, on mitotic activity, and on frequency of chromosomal aberrations in the meristem cells of rootlets in onion, carrot, and tomato plants was studied. The seeds were treated with varying concentrations of aqueous solutions of 3-bromoacetyl-Δ^3-butenolide, 3-bromoacetyl-4,5,5-trimethyl-Δ^3-butenolide, and 3-(2-aminothiazolyl)-4,5,5-trimethyl-Δ^3-butenolide for five hours, then washed, dried, and sowed in Petri dishes. Pre-sowing treatment of the seeds stimulated the growth and development of onion, carrot, and tomato plants, although the seeds reacted differently to the different concentrations and substances. The results indicate that low concentrations of those substances stimulate the early phases of onion, carrot, and tomato plant development. References 5 (Russian).

UDC 577.152.314'14

Substrate Specificity of Restriction Endonuclease Kpn3781

907C0836A Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 16 No 5, May 90 (manuscript received 1 Jun 89; in final form 9 Oct 89) pp 603-604

[Article by Yu. P. Zernov, L. R. Lebedev, I. V. Babkin and V. Ye. Chizhikova, Scientific Research Engineering Institute of Biologically Active Substances, 'Vektor' Scientific Industrial Association, Berdsk, Novosibirsk Oblast]

[Abstract] Studies were conducted on substrate specificity of restriction endonuclease Kpn3781 isolated from Klebsiella pneumonia. The results demonstrated that Kpn3781 recognizes the sequence CCGC-GG, with cleavage site indicated by arrow. Accordingly, Kpn3781 was shown to be an isoschizomer of SacII and SsII. Figures 1; references 6: 3 Russian, 3 Western. SU6 lyribonucleotide Nucleotidyltransferase of Thermus thermophilus in Oligoribonucleotide Synthesis 90

UDC 577.113.6:577.152.31*27'17

Stepwise Oligonucleotide Synthesis. Part 35. Native and Immobilized Polyribonucleotide Nucleotidyltransferase of Thermus thermophilus in Oligoribonucleotide Synthesis

907C0836B Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 16 No 5, May 90 (manuscript received 7 Jul 89; in final form 26 Oct 89) pp 617-624

[Article by E. A. Sedelnikova, O. A. Smolyaninova and S. M. Zhenodarova, Institute of Biological Physics, USSR Academy of Sciences, Pushchino]

[Abstract] Polyribonucleotide nucleotidyltransferase, isolated from Thermus thermophilus HB8, was immobilized on cyanogen bromide activated agarose and (3,3-diethoxypropyl)triethoxysilane-treated macroporous glass for testing in oligoribonucleotide synthesis. Both the native and the immobilized preparations were found fairly efficient in accelerating addition of adenylyl and guanylyl moieties to oligonucleotide primers, and exceeded the efficiency with E. coli and M. luteus polyribonucleotide nucleotidyltransferases. The use of the T. thermophilus enzyme resulted in the synthesis of tri-, tetra- and pentanucleotides bearing guanosine and adenosine moieties on the 3'-end, including structural congeners of the 34-37 anticodon region of yeast $tRNA^{Phe}$. Tables 6; references 22: 9 Russian, 13 Western.

UDC 577.213.7

Synthesis of Human IL-4 Gene by H-Phosphonate Method

907C0836C Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 16 No 5, May 90 (manuscript received 14 Jul 89; in final form 15 Sep 89) pp 625-634

[Article by M. A. Kulagina, N. V. Skaptsova, N. V. Batchikova, A. N. Kurkin and A. V. Azhayev, All-Union Scientific Research Institute of Biotechnology, Moscow]

[Abstract] This study represents the first report of the synthesis of a structural gene by the H-phosphonate method, in this case the human IL-4 gene. Gene sequence was derived from the 192 amino acid sequence of IL-4; initial steps involved synthesis of 32 separate fragments, 23-28 nucleotides long, to ensure a 10-14 bp overlap. In addition, the H-phosphonate method was modified by the use of diazabicycloundecene salts of the substituted nucleoside-3'-hydrophosphites rather than triethylammonium salts [Skaptsova, N.V., et al., Bioorgan. Khim., 15(7): 940, 1989]. Subsequent purification on anion-exchangers and by reverse-phase HPLC yielded oligomers of high purity, with the synthetic gene constructed by the use of conventional ligase technology. The latter produced a 404 bp fragment that was cloned into plasmid pUC18 at EcoRI and HindIII sites. Transformation of E. coli HB101 led to recovery of plasmids bearing the synthetic IL-4 gene. Figures 5; references 14: 1 Russian, 13 Western.

UDC 577.112.4

Chemical Modification of Neurotoxin RTX-III of Sea Anemone Radianthus macrodactylus

907C0836D Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 16 No 5, May 90 (manuscript received 8 Sep 89) pp 643-648

[Article by V. M. Makhnyr and E. P. Kozlovskaya, Pacific Institute of Bioorganic Chemistry, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok]

[Abstract] Studies were conducted on the effects of chemical modification of neurotoxin RTX-III, derived from the sea anemone Radianthus macrodactylus, on toxicity for mice. LD_{50} determinations demonstrated that modification of the sole Trp^{30} moiety by treatment of the molecule with a 20-fold excess of 2-hydroxy-5-nitrobenzyl bromide had no effect on toxicity. Incubation of RTX-III, which possesses 8 carboxyl groups, with 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide, showed that modification of 1 carboxyl group reduced toxicity 2-fold, modification of 2 groups resulted in a 2-fold decrease in toxicity, and modification of 3-4 groups led to a 20-fold reduction in toxicity. Finally, reduction of disulfide bonds in RTX-III with

2-mercaptoethanol and alkylation with iodoacetamide reduced toxicity 100-fold. These findings were consistent with an interpretation that RTX-III binds to sodium channels via hydrophobic and polar groups. Initial binding evidently involves polar mechanisms, while firm complex formation requires hydrophobic interactions. Figures 2; tables 1; references 19: 5 Russian, 14 Western.

UDC 547.962:541.63

Structural Organization of Met-Enkephalin and Endorphin Molecules. Part 3. Theoretical Conformational Analysis of B-Endorphin

907C0836F Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 16 No 5, May 90 (manuscript received 12 Apr 89; in final form 19 Jul 89) pp 661-667

[Article by Ye. V. Suleymanova and Ye. M. Popov*, Azerbaijan State University imeni S. M. Kirov, Baku; *All-Union Correspondence Institute of the Food Industry, Moscow]

[Abstract] Theoretical conformational analysis was conducted on overlapping fragments of β-endorphin. The results led to identification of nine low-energy β-endorphin conformations, and tabulation of dihedral angles of the primary amino acid backbone and side chains. However, the length of β-endorphin precludes establishing a three-dimensional structure with any degree of cartainty. Tables 4; references 13: 2 Russian, 11 Western.

UDC 577.112.5:591.145.2

Amino Acid Sequence of Neurotoxin I From Sea Anemone Radianthus Macrodactylus

907C0438A Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 15 No 10, Oct 89 (manuscript received 15 Feb 89) pp 1301-1306

[T. A. Zykova, E. P. Kozlovskaya, Pacific Ocean Institute of Bioorganic Chemistry, Far East Oblast of the USSR Academy of Sciences, Vladivostok]

[Abstract] Sea anemone toxins modify the properties of the sodium channels of electrically stimulated membranes. Five neurotoxins (RTX-1 through RTX-5) have been isolated from the sea anemone *Radianthus macrodactylus,* and the complete amino acid sequence has been established for four of them. The amino acid sequence for the fifth Radianthus toxin, RTX-1, (LD_{50} = 3600 μ/kg) was established. The polypeptide chain consists of 48 amino acid residues, which include six cysteine residues. Figures 4, references 6: 4 Russian, 2 Western.

UDC 577.113.4

Chemical Reactions in Double-Stranded Nucleic Acids. VIII. Assembly of Hybrid RNA-DNA Duplexes by Using Water-Soluble Condensing Agents

907C0438C Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 15 No 10, Oct 89 (manuscript received 26 Dec 88) pp 1346-1355

[N. G. Dolinnaya, D. T. Ashirbekova, N. I. Sokolova, Z. A. Shabarova, Moscow State University imeni M. V. Lomonosov, Interdepartmental Problem Scientific Research Laboratory imeni A. N. Belozerskiy and the Chemistry Department]

[Abstract] Chemical ligation with 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide and BrCN was studied on a series of duplexes built from a DNA template and two oligonucleotides complementary to it and containing various ribonucleotide insertions, from one ribonucleotide base (duplexes I-III) to the complete ribonucleotide sequence of the strand (duplex VIII). Several reasons for the decrease in the yield of ligation products in the condensation of ribonucleoside bonds are presented. Duplexes II and III have the same nucleotide sequences as duplex I, but differ in the position of phosphate groups in the reaction center, which lowers the effectiveness of chemical ligation in both duplexes. The ratio of the reaction products depends on the strength of the duplex and conformation of the reaction groups at the reaction site. Hybrid duplexes (V-VII) in which ribo- and deoxyribonucleotide bases are condensed on a DNA template have an identical primary structure and differ only in the position and number of phosophate groups in the reaction center. Chemical ligation was used to repair nicks in the large loops of 5S RNA of *E. coli* between fragments. Chemical ligation may be used to repair nicks in naturally occurring nucleic acids. The effectiveness of chemical ligation is primarily determined by the structure of the duplex, and replacing deoxyribonucleotides for ribonucleotides at the ligation site causes a sharp decrease in the effectiveness of the reaction. Figures 6, references 14: 6 Russian, 8 Western.

UDC 541.13-183

Functioning of Glucosooxidase Adsorbed on Pt and Pd/Au Alloy

907c0435 Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA V—BIOLOGICHESKIYE NAUKI in Russian Vol 3 (107), Jul-Sep 89 (Manuscript received 19 July 89) pp 61-64

[Article by V. Y. Razumas and Yu. Yu. Kulis, Institute of Biochemistry, LiSSR Academy of Sciences]

[Abstract] Electrochemical biospecific sensors are finding widespread applied and scientific use. The most advanced are those in which the active center of the adsorbed enzyme exchanges electrons with the electrode directly. The work reported here studied the adsorption of glucooxidase on Pt and Pd/Au electrodes and its functioning. The glucooxidase was obtained from *Aspergillus niger*. Enzyme concentration was determined spectrophotometrically from absoption at 450 nm. All tests were done in a 0.1 M phosphate buffer solution with pH = 7.0. Ellipsometric measurements were made with a 43603-200E Rudolph Research ellipsometer equipped with a helium-neon laser operating at 632.8 nm, angle of incidence 68°. Ellipsometric measurements indicated that the adsorption of glucooxidase took place only on those Pt electrodes that were treated with detergent or with rf plasma. When pH was 7.0, the glucooxidase was adsorbed irreversibly on the Pt and Pd/Au alloys, with formation of a dense monolayer at a concentration equal to 2.4 pmole/cm^2. Rate constants for the irreversible adsorption were 2.6 x 10^{-7} cm/sec for Pt and 1.1 x 10^{-6} cm/sec for Pd/Au. The glucosooxidase adsorbed on the Pd/Au at pH 7.0 had catalytic activity in oxidation of β-D-glucose by oxygen. Figures 3, references 17: 5 Russian, 12 Western.

UDC 612.822.1:577.112.08.3

Isolation of Opiate-Binding Membrane Proteins With β-Endorphin--aminohexyl Sepharose

907C0434D Yerevan NEYROKHIMIYA in Russian Vol 8 No 2, Apr-Jun 89 (manuscript received 10 Jun 88) pp 282-292

[Article by G. A. Izykenova and N. P. Taranova, Institute of Physiology imeni I. P. Pavlov, USSR Academy of Sciences, Leningrad]

[Abstract] In order to understand the mechanisms of CNS function, one must study the structure and functions of opiate receptors in the brain. The purpose of the work reported here was to isolate opiate-binding proteins from rat brain synaptic membranes with a new affine sorbent that contains covalently immobilized β-endorphin, or β-endorphin-o-aminohexyl Sepharose 4B. The researchers were successful in the isolation of two proteins that were similar in terms of isoelectric focusing and SDS-electrophoresis. The pI values of the proteins were 4.4 and 5.3. The proteins differed in their subunit composition and ability to bind [^{3}H]-naloxone. The researchers suggest that the proteins are components of brain opiate receptors. Figures 4; references 21: 5 Russian, 16 Western.

UDC 557.153.4:595.2:599.6/.73

Reaction of Cabbage Fly Brain Cholinesterase, Bovine Erythrocyte Acetylcholinesterase and Equine Serum Butyrylcholinesterase with Organophosphorus Inhibitors

907C0664A Moscow ZHURNAL EVOLYUTSIONNOY BIOKHIMII I FIZIOLOGII in Russian Vol 26 No 2, Mar-Apr 90 (manuscript received 16 Jun 89) pp 145-150

[Article by G. M. Grigoryeva, T. I. Krasnova, and A. Ye. Khovanskikh, Institute of Evolutionary Physiology and Biochemistry imeni I. M. Sechenov, USSR Academy of Sciences, Leningrad]

[Abstract] Comparativies studies were conducted on the reaction of various organophosphorus esters with cabbage fly (Delia brassicae) brain cholinesterase (I), bovine erythrocyte acetylcholinesterase (II) and equine serum butyrylcholinesterase (III). The results showed that k_{II} values for I were one to two orders of magnitude greater than for II and III at 25°C in 0.025 M phosphate buffer, pH 7.5, with thiophosphate and thiophosphonate inhibitors. Accordingly, the kinetic data demonstrated that the active site of I is more reactive than that of the other enzymes, but less specific. Comparison of the kinetic data also indicated that the anionic domain of I possesses an extensive hydrophobic region that binds alkyl and aromatic radicals, as well as a more extended region in the esterase center. In that respects I and III share more similarities that do I and II. Figures 1; tables 2; references 14: 9 Russian, 5 Western.

UDC 577.352.34

Fusogenic Properties of Cobra Venom Cytotoxins in Model Membrane Systems

907C0664B Moscow BIOLOGICHESKIYE NAUKI in Russian No 2, Feb 90 (manuscript received 13 Jan 88) pp 42-50

[Article by S. E. Gasanov, F. G. Kamayev, B. A. Salakhutdinov and T. F. Aripov, Institute of Bioorganic Chemistry, Uzbek SSR Academy of Sciences]

[Abstract] ESR methodology relying on spin labels and ^{1}H-NMR spectroscopy were employed in studies on the effects of cytotoxins V_c5 and V_c1, isolated from the venom of the Central Asian cobra Naja naja oxiana, on bilayer lipid membranes and liposomes. The latter were formed from phosphatidylcholine, cardiolipin, or phsophatidylserine. Under certain conditions both cytotoxins were found to cause membrane fusion. The mechanism of action involved destabilization of the bilayer

packing of the lipids leading to a metastability in the membrane. In addition, the polycationic nature of the toxins favored dehydration of selected membrane sites resulting predisposing to contact between adjacent membranes. Finally, the increase in fluctuation in the polar region of the membranes results in fusion at the site of contact. V_c1 induced less distortion in phosphatidylcholine:phosphatidylserine membranes than V_c5 and failed to cause fusion, whereas the action of V_c5 led to fusion. In the case of phosphatidylcholine:cardiolipin membranes fusion was attained with both cytotoxins, demonstrating that fusion is to a large extent predicated on the nature of lipids in the membranes. Figures 5; references 18: 7 Russian, 11 Western.

UDC 547.811.02:543.544

3,7,8,15-Tetraoxy-12,13-Epoxytrichothec-9-ene in Fusarium graminearum culture

907C0664C Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 2, Mar-Apr 90 (manuscript received 13 Jun 89; in final form 22 Sep 89) pp 267-269

[Article by G. P. Kononenko, N. A. Soboleva and A. N. Leonov, All-Union Scientific Research Institute of Veterinary Sanitation, Moscow]

[Abstract] Studies on the metabolites producted by Fusarium graminearum grown on grain led to the identification of a novel trichothecene identified as 3,7,8,15-tetraoxy-12,13-epoxytrichothec-9-ene. Based terminology currently employed in dealing with trichothecens, the newly isolated compound may be designated as 7,8-dioxycalonectrin tetraol. References 7: 1 Russian, 6 Western.

UDC 547.963.32.07

Chemical and Enzymatic Ligation of Oligodesoxyribonucleotide 5'-Thiophosphates

907C0368b Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 310, No 1, Jan 90 (manuscript received 26 Apr 89) pp 233-236

[Article by S. I. Oshevskiy, Institute of Cytology and Genetics, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] Reactions of a labeled 16-residue oligonucleotide 5'-thiophosphate in DNA-DNA complexes with DNA-ligase, Elman's Reagent, methylethylcyanamide (MEC) and iodine were studied. Polyacrylamide gel electrophoresis showed that chemical ligation products form only with MEC and iodine. A 32-residue polynucleotide formed as a result of a chemical transformation with the participation of the oligonucleotide 5'-thiophosphate group. Similar reaction conditions using 5'-phosphate oligonucleotide did not yield polymeric products. Yields of 60 percent, 3 percent, and 10 percent were seen for DNA-ligase, MEC and iodine, respectively. All ligation products were able to serve as DNA-polymerase templates and formed products which were complete copies of the template. Primary structure analysis showed that the products of DNA-ligase contained a thiophosphate group at the ligation site. When MEC was used, a highly reactive S-phosphorylisothiourea intermediate reacted with the 3'-hydroxyl of the neighboring oligonucleotide. When iodine was used, an active complex between the iodine and the thiophosphate residue may form, with subsequent bonding between the phosphorus and the 3'-hydroxyl of the neighboring oligonucleotide. The reaction described proceeded rapidly in aqueous solution. References 15: 6 Russian, 9 Western.

UDC 57.043

Modeling of Dielectric Heating of Cryopreserved Cell Suspension

907c0372 Kiev KRIOBIOLOGIYA in Russian No 3, Jul-Sep 89 (Manuscript received 4 Jan 88) pp 23-27

[Article by V. D. Bobryshev, A. S. Snurnikov, and V. B. Shved, Institute for Problems of Cryobiology and Cryomedicine, UkSSR Academy of Sciences, Kharkov]

[Abstract] Thawing cryopreserved biological objects remains a serious problem for cryobiology. Traditional methods of thawing, based on the transfer of energy from external heat sources, do not produce uniform heating of the object, and the heating process is difficult to control. Dielectric heating obviates those difficulties, and the process is controlled by regulating the output power of a UHF generator. The researchers here propose an approach that enables the dielectric heating of an actual heterogenous cryobiological system and minimizes local hot spots. Computer modeling of the heating process is used to find the best field parameters. The model that is used is equivalent to a frozen cell suspension and consists of a heterogenous system of ice with two types of spherical liquid inclusions—supercooled freshwater and supercooled seawater—which makes it possible to evaluate the relationship of local overheating to liquid-phase composition in terms of electrophysical characteristics in the UHF range and in much of the HF range and in terms of thermophysical characteristics. In determining the relationship of local hot spots to field frequency in the temperature range of 0-40°C, the researchers used heat capacity, heat conductivity, and dielectric constant real and imaginary numbers for the initial numerical material in their model. They systematized experimental data on the electrophysical parameters for supercooled ice and water and approximated the frequency dependences in the 1-1000 MHz range for the following temperatures: -10, -20, -30, and -40°C. The researchers' results confirm the presence of a considerable number of hot spots in the UHF region of the range. They also determined the existence of frequencies that are dependent on the temperature of the matrix (ice) and on the ion conductivity of the inclusions, on which there is no local overheating of inhomogeneities in the heterogenous medium. The dispersion effect of the attenuation of the external electromagnetic field within the highly differing inclusions is apparently responsible for that phenomenon. For the freshwater inclusions, there is no overheating at frequencies below 100 MHz. As ion conductivity increases, the frequency figure for zero overheating falls. The researchers conclude that the use of HF offers an advantage over UHF in that it enables the possibility of volumetrically uniform heating. Figures 5, references 6 (Russian).

UDC 578.891:578.23:582.282.23

Optimization of HBsAg Gene Expression in Yeast

907C0839A Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 5, May 90 (manuscript received 6 Jul 89) pp 17-20

[Article by S. E. Cheperegin, I. P. Arman and N. N. Granovskiy, Institute of Molecular Genetics, USSR Academy of Sciences; Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] A series of recombinant plasmids were constructed for studies on HBsAg gene expression in Saccharomyces cerevisiae. In order to increase the efficiency of gene expression, transcription terminator sequence of yeast PHO5 was also incorporated into the plasmids. Passive hemagglutination and radioimmunoassays demonstrated that the highest levels of HBsAg synthesis were obtained in S. cerevisiae cells transfected with plasmid pYS2. In that case HBsAg synthesis was equivalent to 0.36 percent of total cell protein. pYS2 DNA was shown to be free of bacterial (E. coli) DNA fragments and the preS region. Figures 3; tables 1; references 18: 8 Russian, 10 Western.

UDC 615.371:582.23].012

Synthesis and Secretion of Oncogene V-SIS Protein in Sccharomyces cerevisiae

907C0839B Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 5, May 90 (manuscript received 7 Dec 89) pp 20-24

[Article by E. A. Ratovitskiy, A. B. Rudenko, N. A. Vasinova, O. V. Kidgotko and B. Kh. Nisman, 'Gidrolizprom' Scientific Industrial Association, Leningrad]

[Abstract] Recombinant plasmid YEp sec1-v-vis, bearing oncogene v-sis, was constructed for transfection of Saccharomyce cerevisiae and production of the gene product, which is analogous to thrombocyte PDGF. Testing of the culture fluid with anti-PDGF monoclonal antibodies showed that production of the gene product reached 2-5 μg/ml. Addition of the recombinant protein to fibroblast cell culture derived from Swiss 3T3 mice enhanced cell proliferation 2- to 5-fold over that obtained with 10 percent embryonal calf serum. Accordingly, the study demonstrated the feasibility of biotechnological production of oncogene v-sis protein using transfection of S. cerevisiae with recombinant plasmids. Figures 5; tables 1; references 21: 7 Russian, 14 Western.

UDC 579.862.1:579.222:577.15[:5]79.254:579.842.11

Cloning β-galactosidase Gene of Streptococcus Thermophilus and Its Expression in Escherichia Coli and Bacillus Subtilis Cells

907C0811A Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 4, Apr 90 pp 10-14

[Article by S. V. Molotov, D. Ye. Duzhiy, V. N. Danilevich and V. V. Sukhodolets; All-Union Scientific Research Institute of Genetics and Selection of Industrial Microorganisms, Moscow]

[Abstract] The first step in production of a superproducer of β-galactosidase is the cloning of the corresponding gene in suitable bireplicon vectors which may be introduced into the Str. thermophilus cells be means of transformation. The β-galactosidase gene from the chromosome of Str. thermophilus, strain kb, was cloned on a vector plasmid pBR322. The corresponding gene was found on the Pst1 DNA fragment. The restriction map of the 6 kb fragment was constructed and discussed. Shortening of the DNA fragment carrying the β-galactosidase gene was achieved by digestion of the recombinant derivative of pBR322 by the restriction endonuclease Sau3A under conditions of incomplete hydrolysis. Fragments obtained were cloned into the BamHI site in the birepliconed shuttle vector pCB20 for gram-positive and gram-negative bacteria. The recombinant plasmids obtained contained the β-galactosidase gene in the inserted fragments of different length. Expression of the cloned β-galactosidase gene in E. coli and B. subtilis cells was discussed. The analyses indicated that the β-galactosidase gene from the chromosome of Str. thermophilus, strain 6 kb, was actually cloned. The obtained recombinant plasmids, derivatives of pCB20, coding for the β-galactosidase gene Str. thermophilus were intended for use on the base of lactic streptococci. Figures 4; references 12: 4 Russian; 8 Western.

UDC 579.852.11:579.252.5:579.254

Conjugational Transfer of Plasmid pAMβ1 in Bacillus Anthracis

907C0811B Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 4, Apr 90 pp 19-21

[Article by O. B. Puzanova, A. S. Stepanova, S. V. Gavrilov et al.; All-Union Scientific Research Antiplague Institute "Mikrob", Saratov, All-Union Scientific Research Institute of Genetics and Selection of Industrial Microorganisms, Moscow]

[Abstract] A study of conjugational transfer of plasmid pAMβ1 from B. thuringiensis into B. anthracis cells used several strains of B. anthracis. The study showed the possibility of conjugational transfer of the plasmid

pAMβ1 into Siberian plague microbe cell and its capacity to mobilize the extrachromosomal replicon pTG141. The effectiveness of conjugational transfer of plasmid pAMβ1 on membrane filters was 2-3 orders of magnitude higher than on a liquid nutrient medium and did not depend on the strain of the recipient. The possibility of conjugational transfer of plasmid pAM into Siberian plague microbe was confirmed and its capacity to mobilize extrachromosomal replicon pTG141 was demonstrated. B. anthracis transconjugates, carrying plasmid pAMβ1 acquired the properties of the donors which suggested the possibility of use of this replicon to mobilize transfer of the natural extrachromosomal determinants of heredity of the Siberian plague pathogen. Figure 1; references 13: 6 Russian; 7 Western.

UDC 341.43.33.27

Production of New Lines of Hybridoma Cells Which Secrete Monoclonal Antibodies to Human IgM

907C0284A Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 12, Dec 89 (manuscript received 30 May 89) pp 104-107

[Article by V. A. Lebitskiy, I. E. Toots, and T. N. Tibinogina, Institute of Microbiology imeni Avgust Kirkhenshteyn, LaSSR Academy of Sciences; Estonian Biocenter for Genetic and Cellular Engineering, ESSR Academy of Sciences]

[Abstract] Monoclonal antibodies to human IgM which can be used in the detection of IgM and in the study of its antigenic characteristics were produced. Male mice were immunized three times with monoclonal IgM, the first two times with Freund's adjuvant as well. Splenocytes of the mice were hybridized with nonsecretory PAI myeloma cells, and the hybridomas were screened, resulting in 22 clones which produced IgM antibodies. Twelve of the clones were established as stable lines. Solid-phase EIA demonstrated that four of the lines produced monoclonal antibodies which reacted with the χ-chain of human Ig, both free and bound. The other eight lines produced monoclonal antibodies which reacted only with monoclonal IgM and not with IgG or IgA or isolated Ig chains. Three of the eight interacted at equal titer with polyclonal or monoclonal IgM. Two gave positive reactions to polyclonal IgM, but at lower titers than to monoclonal. The remaining three lines yielded antibodies which reacted only to monoclonal IgM when using sandwich EIA with affinity-purified polyclonal anti-μ antibodies. In solid-phase EIA, the third group gave a positive reaction with polyclonal IgM, but at much lower titers and with a much weaker signal than to monoclonal IgM. The eight monoclonal antibodies produced are directed towards conformationally dependent antigenic determinants. References 9: 6 Russian, 3 Western.

UDC 581.1.083:632.954

Using in Vitro Selection to Produce Plant Forms Tolerant to Herbicides

907C0369a Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 310, No 4, Feb 90 (manuscript received 1 Jun 89) pp 987-990

[Article by T. A. Yezhova, N. S. Tikhvinskaya, A. M. Bagrova, I. R. Vasilyev, D. N. Matorin, and S. A. Gostimskiy, Moscow State University imeni M. V. Lomonsov]

[Abstract] In vitro tissue culture cell selection and subsequent plant regeneration were used to produce garden pea (Pisum sativum L.) plants resistant to photosynthesis-inhibiting pesticides. Atrazine, diuron and dinoseb were studied in five pea strains. Suppression of growth and viability was found to be a function of herbicide concentration, duration of callus cultivation on the selective medium, callus genotype and degree of differentiation of the callus. Large explantates, or those with buds, were less sensitive to atrazine and diuron. Tissue with buds was more sensitive to dinoseb. Reactions to dinoseb appeared in one week, while reaction to the other two herbicides was most marked at the end of the third week. After three weeks, the mass of living tissue was 2-13 percent of the initial mass. Passage of this tissue through a second cultivation with the same herbicide killed the majority of the remaining cells, as a result of the instability and inefficiency in the selection process. Transplantation of 10,000 explantate calluses resulted in 42 lines resistant to atrazine at 10^{-5} M, 13 resistant to dinoseb at 5×10^{-5} M, and 10 tolerant of diuron. A 50 percent depression in millisecond-delayed fluorescence required about 10 times more atrazine in atrazine-tolerant callus than in controls, indicating decreased sensitivity in the FS II electron acceptor region. This decreased sensitivity was maintained in the 80 regenerated plants. The second generation, subjected to field cultivation, showed increased tolerance to atrazine. Atrazine tolerance was observed in isolated chloroplasts from tolerant plants. Figures 2; references 7: 4 Russian, 3 Western.

UDC 575:616.912-085.371:616.36-002

Expression of Antigens of TBE Virus by Various Recombinant Forms of Vaccinia Virus

907C0369C Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 310, No 4, Feb 90 (manuscript received 25 Jun 89) pp 996-999

[Article by A. A. Khromykh, A. S. Belyayev, M. Yu. Rushnikov, N. K. Danilyuk, and L. S. Sandakhchiyev, corresponding member USSR Academy of Sciences; All-Union Scientific Research Institute of Molecular Biology, Koltsovo, Novosibirsk Oblast]

[Abstract] The researchers produced vaccinia virus recombinants which contain tick-borne encephalitis genes enabling synthesis of TBE antigens in cell culture. The pVAR-15 plasmid, which contains the early 7.5-kbp vaccinia virus promotor and a portion of the thymidine kinase (TK) gene, was used as the vector to construct the foreign gene in the TK gene. The last 29-kbp promotor was also used. Seven recombinant strains were produced. The strain which contained the full-scale C, M, E and NS1 genes exhibited the greatest total encephalitis antigen expression. The strain which contained the L gene and the influenza hemagglutinin anchor gene demonstrated the greatest cell surface antigenicity. The results indicate that an incomplete E protein has lowered antigenic activity, while the absence of the hydrophobic portion decreased its anchoring to the cell membrane. Addition of the leader sequence to the N-terminal of protein E led to enhanced total and surface antigenicity. This may facilitate protein transport across the endoplasmic reticulum membrane. Use of the WR strain gave somewhat more antigenic activity than use of the LIVP strain. Figures 1; references 15: 6 Russian, 9 Western.

UDC 547.963.3:577.158.4

Isolation of Tyrosine Aminotransferase Gene From Rat Gene Library With Molecular Probes Based on M13 Bacteriophage

907C0549 Kiev BIOPOLIMERY I KLETKA in Russian Vol 5 No 6, Nov-Dec 89 (manuscript received 14 Feb 89) pp 93-100

[Article by S. M. Zelenin, I. V. Morozov, N. R. Tevs, V. V. Gorn, V. A. Karginov, and N. P. Mertvetsov, Institute of Bioorganic Chemistry, Siberian Division of the USSR Academy of Sciences]

[Abstract] The researchers tested the possibility of using probes based on single-stranded DNA from bacteriophage *M13* to select clones that have the TAT gene—one of the most studied inducible mammalian enzymes. A rat gene library constructed on the basis of the Charon 4A series λ phage was used. Fragments of rat genome DNA with an average size of 20,000 bp have been cloned for that vector. The researchers here established that the titer of the rat gene library they used consists of approx. 2.2 x 10^6 phages per ml, and among them approx. 0.5 percent are phages that have the *lacZ*operon. Molecular probes based on the single-stranded DNA of hybrid phage *M13* were used to screen the rat gene library and select a specific gene. Such probes have a number of advantages over double-stranded molecular probes. In the probe based on *M13,* after completion of the second chain, the fragment of the probe that participates directly in hybridization remains single-stranded. That section of the probe hybridizes only with complementary DNA adsorbed on nitrocellulose filters. The specific activity of the probe is generally higher than that of the nick-translation probe. The entire radioactive label included in the probe based on single-stranded DNA gives a signal upon hybridization; whereas in most cases the nick-translation probe uses only a part of the label effectively. The main disadvantage of the single-stranded probes in selecting clones from a gene library constructed in the Charon 4A Λ vector is the presence of the *lacZ* gene in that vector and of a fragment of the same gene in the *M13* phages. For the first screening, $1.5 \cdot 10^5$ clones were used, after which specific probes for the TAT and proopiomelanocortin genes were used to select 239 clones for further purification before the formation of individual colonies. Four clones were selected for the TAT gene, and nine for proopiomelanocortin. All four of the TAT gene clones gave positive signals after repeat hybridization, while only one proopiomelanocortin clone responded positively to repeat hybridization. The data from restriction and dot- and blot-hybridization of DNA taken from the gene library of the DNA λ TAT N1 clone make it possible to hypothesize that this molecular hybrid contains a complete TAT gene that may differ somewhat in structural organization from that described by Shinomiya *et al.* Figures 6, references 13: 4 Russian, 9 Western.

UDC 579.842.11.017.6

Somatotropin Biosynthesis by a Recombinant E. coli Strain

907C0417B Moscow MIKROBIOLOGIYA in Russian Vol 58 No 5, Sep-Oct 89 (manuscript received 7 Jun 88) pp 791-796

[Article by N. V. Gorlatova, N. V. Yeroshina, V. M. Ananin, L. M. Baryshnikova, L. V. Akimenko and Ye. L. Golovlev, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino]

[Abstract] One of the principal problems in cultivating recombinant strains is their instability. The data available on recombinant producers of proteins or metabolites are scarce. The goal of this work was to use *E. coli K-12*—the producer of human somatotropin hormone—to investigate the effect of factors such as growth rate degree of limitation on vector dynamics, strain stability, and effectiveness of cloned gene expression. The researchers found that the activity of the cellular protein synthesis apparatus changed proportionately to the growth of the recombinant *E. coli* strain and did not correlate with the synthesis of somatotropin. The synthesis of somatotropin depended on the number of plasmid-containing cells capable of producing the hormone, the rate of cell culture growth, duration of the fermentation, and cultivation conditions. It was shown that the stability of plasmid-containing strains diminished with the drop in the flow rate of the enzyme. Somatotropin biosynthesis was highest at a low dilution rate. Figures 3; references 18: 3 Russian, 15 Western.

Diphtheria: Epidemiological and Immunological Situation in Alma-Ata Oblast

907C0271B Alma-Ata ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 8, Aug 89 pp 11-13

[Article by S. G. Markova and I. Ye. Pilskiy, Scientific Research Institute of Epidemiology, Microbiology and Infectious Diseases, Alma-Ata, and Alma-Ata Oblast Epidemiological Station]

[Text] Extensive immunization of the child population against diphtheria, begun in 1959, led to a sharp decline in morbidity and mortality associated with the disease. After a lengthy absence of diphtheria cases and diphtheria bacteria carriers (1969-1975), an increase in the activity of the epidemic process was once again noted in 1976. In addition to recording manifest forms, we have been identifying carriers of toxigenic *Corynobacterium diphtheriae* each year (since 1979).

This paper presents data from an analysis of morbidity associated with diphtheria infection and of the immunological structure of the child population of Alma-Ata Oblast in relation to diphtheria and tetanus. Morbidity over a 20-year period (1969-1988) was studied in order to assess the epidemic process. We analyzed 2,117 samples of blood sera (from 2,022 children and 95 adolescents) with the passive hemagglutination test used in a micromethod employing erythrocytic diphtheria and tetanus test kits prepared in the children's infection laboratory of the Kazakh SSR Scientific Research Institute of Epidemiology, Microbiology and Infectious Diseases. The conditionally protective level of diphtheria antitoxin was adopted as 0.03 IU/ml, and that of tetanus antitoxin was adopted as 0.01 IU/ml.

In the designated period, 14 patients and 61 carriers of toxigenic *Corynobacterium diphtheriae* were recorded in the oblast—a ratio of 1:4. No patients with clinically expressed forms of diphtheria were identified in 1988.

Diphtheria morbidity maintained a fall-winter seasonality. The maximum number of cases occurs in October-February (78.6 percent). In this case all cases are isolated, and they are not related to each other.

Most patients were identified among school children aged 9-12 (64.3 percent), considerably fewer cases were identified among adolescents and adults (28.6 percent), and the fewest were among preschool children (7.1 percent). Analysis of the causes showed that because rural schools lack medical workers, the quality of medical services is worse than in preschool children's institutions.

The level of toxic forms of illness, which led to complications in two cases (myocarditis, hemmorrhagic syndrome), is high (50 percent). The frequency of fatal outcomes depended on the timeliness of diagnosis, the severity of illness, and the quality of therapeutic measures, and it was 14.3 percent. Clinical diagnosis of diphtheria presents certain difficulties, which resulted in late hospitalization and treatment. For example, nine persons were hospitalized in the first three days of illness, but the correct diagnosis was established for only five of them. On the whole, the diagnosis was confirmed bacteriologically in 35.7 percent of patients; biovara gravis strains were isolated from 80 percent of them, 35.7 percent of those patients had not been immunized, and 57.1 percent had been improperly immunized in one way or other.

Study of the immunological status of the child population revealed that, on the whole, 16.1 percent of the subjects were not protected from diphtheria toxin. Simultaneous determination of the level of diphtheria and tetanus antitoxins in sera made it possible to objectively assess actual immunization of children and adolescents with DTP and DT vaccines. The low percentage of children not immune to tetanus (3.4 percent) indicates that decreed age groups are being immunized against diphtheria and tetanus in the oblast. However, in a number of rural rayons that are unfavorable in terms of diphtheria (Chilikskiy, Balkhashskiy and Kaskelenskiy), a high percentage of nonimmune persons has persisted over the last 9 years—an average of 25.3 percent in relation to diphtheria and 6.0 percent in relation to tetanus.

The results of an analysis of immunity depending on blood sampling time are of a certain amount of interest. The highest nonimmune indicators were identified in September-November, averaging 27.2 percent in relation to diphtheria and 5.8 percent in relation to tetanus. This situation is apparently associated with the fact that new classes are formed in this period of the year in schools of general education and in boarding schools, the contingents of which were tested by us serologically at the beginning of the school year. In addition, a large percentage of schoolchildren in rural areas come from remote livestock breeding farms, and immunization programs for them have not been set up properly.

An analysis of immunity in terms of age revealed that children in the age groups of 4-5, 8-10 and 13-14 are the least protected. An average of 24.0 percent were not immune to diphtheria, and 5.8 percent were not immune to tetanus. Vaccinations carried out at ages 2, 6 and 11 reduced the percentage of nonimmune children in the first two years after the injections, but then the number of unprotected children increased once again. The causes of this phenomenon remain unclear, which dictates the need for studying the effect of individual environmental factors on the state of antitoxic immunity in specific regions. It should be noted that as the number of revaccinations increases (carried out within the first two years after vaccination), the number of persons not immune to diphtheria decreases from 20.2 percent to 7.5 percent.

Thus, the state of immunity to diphtheria among children in the oblast is at a relatively low level. To improve the epidemiological situation and increase the percentage of persons immune to diphtheria and tetanus

toxins, the volume of bacteriological and serological tests has been dramatically increased here in recent years. Special attention has been devoted in this case to contingents making up the risk groups: middle vocational-technical schools, boarding schools, closed sanatoria, children's homes, and remote livestock breeding areas. A complete revision of immunization efforts has begun, to include conducting a population census, checking documents and reviewing the correctness of individual immunization plans. Individuals with an unsatisfactory immunization history are being screened, their immunity is being checked, and decisions are being made as to whether they need additional immunization with associated DT-M, associated D-M or associated T-M toxoid.

The relatively high level of diphtheria morbidity and the relatively large number of carriers of *Corynobacterium diphtheriae* and of persons not immune to diphtheria toxin indicates that the epidemiological and immunological situation in Alma-Ata Oblast is not good. Students in schools of general education and boarding schools were predominant in the overall structure of patients. These contingents had a low immunity (76.3 percent to diphtheria and 94.6 percent to tetanus), and therefore they should be treated in the future as high-risk groups requiring special attention and monitoring.

UDC 616.36-002-02

Etiologic Structure of Viral Hepatitis in Mary Oblast

907C0406A Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 9, Sep 89 pp 3-6

[Article by M. I. Ommadova, O. I. Nazarova, G. D. Muradova and M. B. Annamukhamedov, Ashkhabad Scientific Research Institute of Epidemiology and Hygiene imeni S. M. Dursunova]

[Abstract] An analysis was conducted on the etiologic structure of viral hepatitis in Mary Oblast, based on diagnostic studies on 80 adult and 55 pediatric patients. The study relied on RIA and EIA and demonstrated that 48.7 percent of the cases represented mixed infections. In general, the fecal-oral route of transmission predominated (43.8 percent), followed by mixed HA + HB infections (39.4 percent), and hepatitis transmitted by parenteral routes (21.3 percent). The mixed infections were represented by HA + Non-A,Non-B combinations in HBsAg positive individuals, HB + delta agent, HB + HA, and HA + HB + delta virus combinations. The high percentage of delta infections (18.2 percent) among the HB patients and the incidence (1.2 percent) of delta infections in HBsAg carriers appear to reflect unique features of viral hepatitis in Turkmenistan. References 13: 12 Russian, 1 Western.

UDC 616.36-002-036.2-084.4

Epidemiology of Viral Hepatitis A in Khalachskiy Rayon

907C0406B Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 9, Sep 89 pp 6-10

[Article by I. Yu. Gasanov, A. I. Katkov, Ch. Allaberdyyev, A. O. Ovezov and A. Ch. Atakishiyeva, Chair of Infectious Diseases and Epidemiology, Turkmen Order of People's Friendship State Medical Institute; Khalachskiy Rayon Sanitary Epidemiologic Station]

[Abstract] Epidemiologic data for viral hepatitis A in the Khalachskiy Rayon, Chardzhou Oblast, were evaluated for the period 1958-1986 in order to devise preventive strategies. Assessment of the epidemiologic data revealed that major outbreaks of hepatitis A are encountered every 8 years in Turkmenistan on the whole, whereas in the Khalachskiy Rayon the periodicity is on the order of ten years. In years of maximum morbidity (1975 and 1985), peak incidence was evident in summer and early fall; while in relatively quiescent years, most cases were encountered in winter. In general, in large outbreaks, the first cases invariably involved preschool children, followed by schoolchildren, and then adults. The statistical information also disclosed that most infections in children are acquired at home; the disease incidence in schoolchildren and in children attending day care facilities is generally 2- to 3-fold lower than in those not attending. Figures 1.

UDC 616-002.5.36-002

Carrier Rate of HBsAg in Tuberculosis Patients in Turkmen SSR

907C0406C Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 9, Sep 89 pp 10-12

[Article by I. A. Ibragimov, V. G. Sadykov, L. D. Zagozina, N. K. Isayeva, I. Yu. Gasanov, N. A. Sayilov and L. M. Mazina, Chair of Infectious Diseases and Epidemiology, Turkmen Order of People's Friendship State Medical Institute; Ashkhabad Scientific Research Institute of Epidemiology and Hygiene imeni S. M. Dursunova]

[Abstract] In order to determine the incidence of viral hepatitis B among tuberculosis patients in Tukmenistan, sera obtained from 660 patients were tested for HBsAG by the reverse passive hemagglutination test. The study revealed that 12.4 percent of the patients were positive for HBsAg. The clinical impression was that most of the infections were acquired through close familial contact rather than parenterally in hospitals, where strict sterility and other safety measures are enforced. References 7 (Russian).

UDC 616.36-002(575.4)

Delta Hepatitis in Turkmenia

907C0406D Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 9, Sep 89 pp 12-15

[Article by O. I. Nazarova, M. I. Ommadova, M. O. Favorov, T. L. Yashina and N. V. Man, Ashkhabad Scientific Research Institute of Epidemiology and Hygiene imeni S. M. Dursunova; Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences]

[Abstract] Studies on 217 patients with viral hepatitis in Turkmenia revealed the presence of delta virus in 24.6 percent of the patients with hepatitis B (HB) virus infections. In addition, 1.4 percent of the patients presented with mixed HB + Non-A,Non-B + delta infections, and 30 percent of the HB + HA patients also bore the delta virus. The delta virus infection occurred predominantly in the age bracket of 15-39 (76.5 percent of delta cases). Anamnestic data demonstrated that 64.7 percent of the delta-positive individuals had previous contact with HB patients, with patients in the family accounting for 23.5 percent of the contacts. Additional breakdown showed that 29.3 percent of the delta carriers had a history of blood transfusion, 29.3 percent had been hospitalized, and 23.5 percent had received injections on an out-patient basis. In general, delta hepatitis was characterized by prolonged jaundice (52 days in 52.9 percent of the cases), hepatomegaly on discharge (64.7 percent), elevated enzyme levels (82.3 percent), and a mortality rate of 11.8 percent. References 4: 3 Russian, 1 Western.

UDC 616.981.42-036.2

Clinical and Epidemiologic Features of Acute Brucellosis

907C0406E Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 9, Sep 89 pp 24-26

[Article by E. B. Bayramova, V. F. Ivanova, R. Z. Rakhimova, E. A. Kuzakhmedova and I. Ye. Petrova, Chair of Infectious Diseases and Epidemiology, Turkment Order of People's Friendship State Medical Institute; City Hospital of Infectious Diseases]

[Abstract] An assessment was conducted on 39 cases of acute Br. melitensis infections in order to obtain a better clinical and epidemiologic appreciation of the problem in Turkmenistan. The data were derived from 39 patients divided almost equally between women (20) and men (19); most of the patients (22) were under 30. The majority of the patients were blue-collar workers (64 percent), while 28 percent were in constant contact with domestic animals. Correct initial diagnosis was made in only 17 of the cases; in addition, the beginning of the disease was insidious in 89.7 percent of the patients. Antibiotic therapy with streptomycin, tetracycline, levomycetin, and aminoglycosides, particularly combination chemotherapy, led to abatement in 7-10 days. Nine of the patients were discharged as cured, while 30 were discharged in a clinically satisfactory state and experienced recurrences. References 6 (Russian).

UDC 616.98:579.83(470.45)

Brucellosis Morbidity in Volgograd Oblast

907C0406F Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 9, Sep 89 pp 26-27

[Article by V. N. Lazarev, Ye. A. Ionidi, I. Kh. Giniyatulina, V. F. Orekhov and Yu. A. Zheludkov, Chair of Infectious Diseases, Therapeutics Faculty, Volgograd Order of the Red Banner of Labor Medical Institute]

[Abstract] Recent studies have shown that the incidence of brucellosis in the Volgograd Oblast stands at 0.9 percent per 100,000 population, and that the number of positive-testing animals is on the increase. In 1987 alone, the number of positive animals increased by 29.6 percent in comparison with the preceding years. In addition, 20 patients were diagnosed with brucellosis. The data also revealed that 60 percent of the patients were infected by sheep and that two veterinary technicians were infected as a result of poor laboratory techniques. Most of the patients were males, 20-60 years of age, engaged in occupations that brought them in close contact with domestic animals. These findings again point to the importance of animal testing and disinfection as key factors in brucellosis control.

UDC 616.36-002.1-002:578.891]-036.2-(47+57)

Incidence of Delta Infection in USSR

907C0441F Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 10, Oct 89 (manuscript received 18 Jun 88) pp 96-101

[Article by S. O. Vyazov, N. Ye. Paladi, A. L. Mkhitaryan, I. P. Gorbarets, Ye. K. Yavorkovskaya, D. M. Yarasheva, N. S. Asfandiyarova, and G. L. Ryazanova, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] The hepatitis delta virus is a defective, RNA-containing agent which requires a hepatitis B infection for replication. Literature data and the authors' data on the incidence of delta virus in the USSR are reviewed. Among 1,124 asymptomatic HBsAg carriers in the European USSR, the rate of manifestation of anti-delta antibodies ranged from 0 percent in Minsk to 5.5 percent in Yerevan and 17.6 percent in Kishinev. The rates reflect the prevalence of hepatitis B virus. Rates from 10.8 percent to 22.0 percent were seen in Central Asia, Kazakhstan and Moldavia. A low prevalence of anti-delta was seen in Irkutsk and a high rate in Tuba. About

30 percent of those with anti-delta possessed IgM antibodies, with this rate independent of location. Based on known rates of hepatitis B infection, it may be estimated that 200,000-750,000 cases of hidden liver disease due to hepatitis delta virus exist in the USSR. In children with chronic hepatitis, 9.7 percent of the patients in Europe, and 38.5-64.3 percent of the patients in Central Asia and Kazakhstan showed anti-delta. In adults the rate was 34.1-48.0 percent in Europe and 60.8 percent in Central Asia. Patients with acute HBsAg-positive hepatitis in Moscow exhibited markers for delta relatively rarely. Markers for delta infection were seen relatively frequently in patients with a serious disease course, particularly in fulminating hepatitis. The data indicate that the delta virus participates in the formation of the serious form of acute hepatitis. References 31: 19 Russian, 12 Western.

Epidemiological Description of Patients with Chronic Viral Hepatitis B in Tashkent

907C0460C Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 11, Nov 89 (manuscript received 19 Oct 88) pp 49-50

[Article by L. V. Kudasheva, Kh. M. Mustafayev, and P. M. Frenkel, Republic Sanitary and Epidemiological Station, UzSSR Ministry of Health]

[Abstract] The epidemiological mechanisms and features of chronic viral hepatitis B in Tashkent were studied over a five-year period, from 1983 through 1987. Morbidity with chronic viral hepatitis tended to increase and was three times greater in 1987 than in 1983, with annual increases ranging from 7 percent to 92.4 percent and averaging 35.1 percent. The number of children under the age of 14 with viral hepatitis increased from 45.1 percent in 1983 to 64.7 percent in 1987. Men were more likely than women to suffer from viral hepatitis. Morbidity with chronic viral hepatitis was more frequent in the winter and spring. References 5: 4 Russian, 1 Western.

UDC 616.993.162-036.21

Activation of Anthroponotic Cutaneous Leishmaniasis in Ashkhabad

907C0415A Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 5, Sep-Oct 89 (manuscript received 10 Feb 89) pp 71-74

[Article by R. S. Dobrzhanskaya, Kh. Kh. Khuseyinova, V. M. Safyanova, L. P. Yemelyanova, T. A. Sukhanova, Ye. N. Ponirovskiy, Scientific Research Institute of Disease, Ministry of Health of the Turkmen SSR; Institute of Zoology, Turkmen SSR Academy of Sciences, Ashkhabad; Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] Cutaneous leishmaniasis occurs mainly in central Asia and the Transcaucasus, with the most active foci in the Turkmen SSR. Of the two forms of cutaneous leishmaniasis, anthroponotic cutaneous leishmaniasis (ACL), which is caused by *Leishmania tropica,* used to be found primarily in three large cities of the Turkmen SSR—Ashkhabad, Iolotani, and Mary. A program initiated in the 1950s, however, virtually eliminated ACL from Turkmenia by the early 1960s. Almost 30 years later, in 1987, cases of ACL began to grow steadily. The observations of several patients with ACL are presented here. Electrophoretic analysis of three strains of leishmania demonstrated that the *Phlebotomus sergenti* sand fly is the carrier of the disease. Urgent measures need to be taken to prevent the further spread of anthroponotic cutaneous leishmaniasis. Figures 3, references 4 (Russian).

UDC 616.98:579.834.114]-036.2(571.62)

Lyme Disease in Khabarovsk Kray

907C0415B Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 5, Sep-Oct 89 (manuscript received 27 Feb 89) pp 74-78

[Article by M. L. Levin, M. I. Kalinin, V. N. Kryuchechnikov, Scientific Research Institute of Epidemiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences; Khabarovsk Medical Institute]

[Abstract] Field and clinical laboratory tests were performed in 1986-1988 in Khabarovsk Kray for cases of Lyme disease (pathogenic agent *Borrelia burgdorferi* carried primarily by the *Ixodes persulcatus schulce* tick). Adult *Ixodes persulcatus* ticks were collected in the spring and summer months 15-20 km from Khabarovsk. Five different strains of *Borrelia burgdorferi* were found in over 20 percent of the ticks examined. It is believed that at least one of those strains differs from the known types of American and European strains in its antigenic properties. Results of the examination of the ticks indicate the presence of natural foci of Lyme disease in the Khabarovsk Kray. The level of infection with Lyme disease is as high in Khabarovsk as in the European part of the USSR. Lyme disease was found and serologically confirmed in Amur Oblast and the Maritime Kray in 1988. Lyme disease occupies an important place in the infectious pathology of the Far East and deserves close attention. References 14: 8 Russian, 6 Western.

UDC 579.252.5:577.21.01

Transposons and Replication: Tn5 Suppresses Plasmid RP1 ts Mutation Preventing Replication in Escherichia coli

907C0835A Moscow GENETIKA in Russian Vol 26 No 5, May 90 (manuscript received 11 Jan 89) pp 833-841

[Article by G. E. Baumanis, S. Ya. Auza and Yu. O. Yakobson, Institute of Microbiology imeni A. Kirkhenshteyn, Latvian SSR Academy of Sciences, Riga]

[Abstract] A phenomenon designated 'transposon suppression' has been discovered in which transposon Tn5 promotes replication of plasmid RP1, otherwise incapable of replication because of mutation in tsr12 gene. The study involved construction of hybrid plasmid RP1 bearing a deletion in gene aphA (Km), two intact transposons (Tn1 and Tn5) derived from plasmid pMG8, and mutation tsr12 of plasmid RP1-6 Rep(ts12). The results demonstrated that Tn5 in the hybrid plasmid or in the E. coli chromosome maintained replication of the plasmid at non-permissive temperature, a mechanism involving suppression of the tsr12 mutation. Tn5 transposon with a mutation in the gene encoding transposase were incapable of suppression. Figures 4; tables 2; references 14: 4 Russian, 10 Western.

UDC 633.11+633.14:631.523+631.527

Genetics of Triticale Breeding (X Triticale). Part 1. Direct Production of Primary Meiotic Triticale

907C0835B Moscow GENETIKA in Russian Vol 26 No 5, May 90 (manuscript received 30 Nov 88) pp 894-901

[Article by I. A. Gordey and G. M. Gordey, Belorussian Scientific Research Institute of Agriculture, Minsk Oblast]

[Abstract] A direct method has been developed for production of primary meiotic octoploid (AABBDDRR, 2n = 8x = 56) and hexaploid (AABBRR, 2n = 6x = 42) meiotic triticales. The technique used involved colchicine-treatment of unreduced wheat macrogametes and subsequent pollination by tetraploid rye pollen. The resultant meiotic triticales were characterized by greater cytochemical stability and fertility ($P < 0.01$) in comparison with mitotic amphiploid plants, which were produced by colchicine-mediated doubling of the chromosome number of sterile wheat-rye F_1 hybrids. figures 1; tables 2; references 16: 10 Russian, 6 Western. SU6 is A in Russian

UDC 579.843.95:579.254].08

Use of Mini-Mu Replicons for Cloning Structural Genes of Yersinia pestis

907C0839C Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 5, May 90 (manuscript received 15 Nov 89) pp 24-27

[Article by A. V. Rakin and V. A. Rykova, Scientific Research Antiplague Institute, Rostov-on-Don]

[Abstract] A system of Mu phages and pEG plasmids was employed to assess the use of mini-Mu replicons for cloning structural genes of Yersinia pestis. The system involved lysogenic Y. pestis TS (Mu pAp1)(pEG5155) and TS (Mu pAp1)(pEG5086) as the phage donors following thermoinduction, and E. coli K12 as receptors. Additional studies were conducted with homolgous Y. pestis x Y. pestis system employing Y. pestis TS (Mu pAl1)(pEG5155) as the donor. Analysis of the transduced cells showed acquisition of novel phenotypes in both systems. These observations were indicative of production of mini-Mu replicons incorporation the Y. pestis leu^+ gene within a 4.8 to 21 kbp cloned DNA fragment. Figures 1; tables 4; references 9: 2 Russianm, 7 Western.

UDC 576.356:633.1

Creation of New Alloplasmatic Lines of Soft Wheat and Common Rye with Barley Cytoplasm

907C0369B Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 310, No 4, Feb 90 (manuscript received 21 Jun 89) pp 993-996

[Article by L. A. Pershina, O. M. Numerova, L. I. Belova, E. P. Devyatkina, L. P. Solonenko, and V. K. Shumhyy, corresponding member USSR Academy of Sciences; Institute of Cytology and Genetics, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] The researchers here describe the creation of a fertile, previously unstudied alloplasmatic line of *T. aestivum* L. wheat with *H. vulgare* L. and *H. geniculatum* All. barley cytoplasm, as well as an alloplasmatic line of *S. cereale* L. rye with *H. geniculatum* All. and *H. jubatum* L. barley. Nepolegayustchiy and Ya-319 barley were crossed with Saratovskiy 29 wheat. As a result of backcrossing with VS_5-VS_7, the barley chromosomes were replaced by wheat chromosomes, forming a 42-chromosome plant, which was characterized by masculine sterility. Alternate backcrossing of the preliminary *H. vulgare* x Saratovskiy 29 hybrid yielded 42-chromosome plants with varying degrees of self-fertility. Analysis of the electrophoretic spectra of the gliadins, the alcohol-soluble reserve proteins in the caryopses, demonstrated identical spectra in self-fertile alloplasmatic lines for the wheat varieties involved in

he crossing. Hordeins, the alcohol-soluble reserve proteins of the barley, were not seen, which confirms that the barley genome was replaced by the wheat genome. Cytoplasmatic analysis of meiosis also gave results appropriate for the wheat strains involved. In order to overcome difficulties in crossing wheat with *H. geniculatum,* a preliminary cross of *H. geniculatum* with *T. aestivum* (Pirotrix 28) was propagated vegetatively for 12 months. More than 300 regenerates were field cultivated, including Pirotrix 28, which exceeded the initial hybrid in female fertility. *H. geniculatum* x Pirotrix 28 and its regenerates yielded about 70 percent self-fertility. A double backcross scheme was used to produce alloplasmatic rye with *H. geniculatum* and *H. jubatum* cytoplasm. The 14-chromosome plants obtained had varying levels of self-fertility, were resistant to unfavorable factors and some had low levels of 5-alkylresorcinols. References 13: 7 Russian, 6 Western.

UDC 616-092:612.017.1.064]-022.7:578.828.6-07:616.153.962.4-097-078.333

Immunochemical Analysis of AIDS-Positive Human Sera With Standard EIA

907C0276A Moscow IMMUNOLOGIYA in Russian No 4, Jul-Aug 89 pp 22-25

[Article by A. Ya. Kulberg, I. A. Tarkhanova, G. G. Miller and A. F. Bykovskiy, Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] Substantiation of immunochemical criteria of assessment of properties of serum factors interacting with standard HIV antigens or their synthetic analogs involved the use of five sera with highly positive reaction to AIDS in enzyme immunoassay and the sera of positive and negative controls included in the Peptoskrin AIDS diagnostic test kit. The nature of serum factors reacting with HIV was assessed by fractionation of sera and their immunoglobulin fractions with a Centriflo molecular filter and by processing the material under study with antibodies to framework determinants of the variable domain of the heavy chain of immunoglobulins or with Fab'-fragments of those antibodies. The immunochemical criteria used by the researchers made it possible to detect false-positive reactions to AIDS in standard test systems based on indirect EIA. The false-positive reactions were attributed to the presence of complexes of immunoglobulins and certain R proteins in the serum under study. The study provided data which can be important in compiling sound principles for massive screening for AIDS. It was established that a highly positive reaction to AIDS in indirect EIA may be caused by serum factors not belonging to antibodies in terms of immunochemical properties. These factors are present in the immunoglobulin fraction of the serum, but are destroyed upon filtration through the Centriflo membrane filter. In contrast to antibodies, these factors are inactivated by antibodies to framework determinants of the variable domain of heavy chains of immunoglobulins. Figures 3; references 12: 7 Russian, 5 Western.

UDC 615.275.4:541.64].03:[616-092:612.017.1.064

Immunomodulating Activity of Polyelectrolytes Modified by Antioxidants and Macroheterocycles

907C0276B Moscow IMMUNOLOGIYA in Russian No 4, Jul-Aug 89 pp 46-49

[Article by V. Yu. Skvortsov, T. B. Masternak, B. D. Sviridov, L. d. Gorbacheva, A. S. Larin, Ye. B. Zabanova, Ye. A. Zhigadlo, I. P. Sadovnikova, and A. S. Ivanova, Institute of Immunology, USSR Ministry of Health, Moscow]

[Abstract] The researchers studied the link between chemical structure of conjugates and immunomodulating activity, the effects that the polymer and modifying components have on each other, and the effects of degree of modification, nature of charge, and polymer molecular weight. Polyelectrolytes synthesized at the Leningrad Institute of High Molecular Compounds were used. Immunomodulating activity of the physiologically active low-molecular compounds of the polyelectrolytes depended upon the molecular weight of the polymer, the nature of its functional groups, the size and nature of the charge and the degree of modification. Modification of polycations and polyanions with differing molecular weight and charge magnitude by the antioxidants and macroheterocycles produced or intensified the immunostimulating activity of the initial polymers, the amount of which being determined basically by the nature of the modifier and the degree of modification. Simultaneous modification of the copolymers of N-vinylpyrrolidone with crotonic acid by two physiologically active, low-molecular compounds that differed in mechanism of action extended the effective range of doses of the polyanion. Relative independence of the immunostimulating activity of the modified conjugates from properties of the polyelectrolyte makes it possible to select polymer carriers for creation of artificial vaccines based on them. Figures 3; references 11: 8 Russian; 3 Western.

UDC 612.112.3+612.112.94.017.1].063:615.384:[547.391.1+547:745

Activation of Phagocytic Cells and Cellular Immunity by Certain Synthetic Polyelectrolytes

907C0276C Moscow IMMUNOLOGIYA in Russian No 4, Jul-Aug 89 pp 49-52

[Article by V. M. Zemskov, A. V. Khramtsov, S. V. Rodionov, A. A. Barsukov, V. I. Pantin, L. P. Alekseyev, A. A. Vedernikov, M. I. Mustafayev, and A. V. Nekrasov, Institute of Immunology, USSR Ministry of Health, Moscow

[Abstract] A study of the effect of synthetic polyelectrolytes on a system of phagocytic cells and on formation of cellular immunity, especially transplantation immunity, involved single intraperitoneal injection of various doses of the polyelectrolytes—copolymer of acrylic acid with N-vinylpyrrolidone (molecular mass 100 kD) and N-oxide-polyethylenepiperazine (molecular mass 40 kD)—into F_1(CBA X C57BL/6) mice, isolation of phagocytic cells within 48 hours and analysis of them. The polyelectrolytes activated macrophages by increasing glycolysis, hexose-monophosphate bypass, the urea cycle and activation of lysosomal hydrolases by expression of Fcγ-receptors. Poly-4-vinyl-N-ethylpyridine bromide (molecular mass 197 kD) was less active. N-oxide-polyethylenepiperazine intensified generation of active oxygen macrophages as evaluated by chemiluminescence; the polyanion was inactive in this respect. All the polyelectrolytes studied increased formation of transplanation immunity. Figures 1; references 8 (Russian).

UDC 612.017.1.014.46.08

Immune Response to 2,4,6-Trinitrobenzene Sulfonic Acid (Hapten) Incorporated Into Soluble Polyelectrolyte-Protein Complex and Its Dependence Upon Epitopic Hapten Density

907C0276D Moscow IMMUNOLOGIYA in Russian No 4, Jul-Aug 89 pp 88-89

[Article by M. I. Mustafayev, A. Sh. Norimov, S. G. Zavgorodniy and Ye. D. Filatova, Institute of Immunology, USSR Ministry of Health, Moscow]

[Abstract] It has been shown that immunization of mice by derivatives of trinitrobenzene (haptens) incorporated into such relatively simple macromolecules such as synthetic polybases—polyvinylpyridines—increases the immune response of the body to hapten molecules. Antigenic properties of picrates of polybases, in contrast to conjugates of haptens with protein carriers, appear in the absence of adjuvants, which suggests the possibility of creating complete artificial antigens. In light of that, there was interest in synthesizing a water-soluble polyelectrolyte-protein complex containing different quantities of trinitrobenzene sulfonic acid [TNBS] and studying the immune response to TNBS as a function of the epitopic density of the hapten molecules. The line (CBA X C57BL/6)F_1)was used in the immunological experiments. Introduction of hapten molecules into stable water-soluble polyelectrolyte-protein complex increased considerably (by a factor of 10-15) the immune response of the body to the hapten. In contrast to mixtures with PAF, during complex formation of conjugates of TNP/BSA (trinitrophenyl/beef serum albumin) with polacrylic acid, several molecules of the conjugate were bound with one macromolecule of polyacid and increased proportionately the epitopic density of the regularly situated TNP groups, incorporated into the compact complex particle. This produced a linear increase of amounts of antibody forming cells as a function of the number of TNP groups, bound with the protein globule. Figures 2; references 10: 6 Russian; 4 Western.

UDC 577.112.083.3:615.371

Antigen Structure of Foot and Mouth Disease Virus V. Protecting Susceptible Animals to Foot and Mouth Disease by Using Synthetic Peptide

907C0438B Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 15 No 10, Oct 89 (manuscript received 2 Mar 89) pp 1313-1317

[A. V. Yarov, V. M. Gelvanov, L. A. Grechaninova, A. Yu. Surovoy, O. M. Volpina, V. T. Ivanov, A. V. Chepurkin, N. N. Dryagalin, V. N. Ivanyushchenkov, Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR Academy of Sciences, Moscow; All-Union Scientific Research Foot and Mouth Disease Institute, Vladimir]

[Abstract] A peptide was synthesized with the sequence of protein VP_1 of foot and mouth disease virus strain A_{22} to protect farm animals from this disease. In the process of the research, immunization with certain peptide sequences produced only 50-80 percent protection in guinea pigs. Two-stage immunization with peptide sequence 135-159 of VP_1 of strain A_{22}, which was synthesized with the solid-phase technique, provided 100 percent protection to the animals. Thus, extending the VP_1 (136-152) fragment of the A_{22} strain to residue 159 substantially increases the ability of the peptide to induce the formation of antipeptide and virus-neutralizing antibodies and increases the activity of the synthetic peptide. References 12: 3 Russian, 9 Western.

UDC 615.275.4.015.46:612.017.1.063

Study of Immunostimulating Properties of Salmosan

907c0373 Moscow IMMUNOLOGIYA in Russian No 5, Sep-Oct 89 (Manuscript received 24 Feb 88) pp 29-32

[Article by V. M. Zemskov, A. A. Barsukov, S. A. Beznosenko, S. V. Rodionov, N. I. Kochergina, L. P. Alekseyev, A. A. Vedernikov, N. V. Medunitsyn, I. I. Podoplelov, M. A. Tumanyan, Institute of Immunology, USSR Ministry of Health, Moscow]

[Abstract] This paper presents data on the effects of salmosan on aspects of metabolism and function of phagocytes, on the mechanisms of amplification of humoral immunity to T-dependent antigen, and on cellular immunity. Salmosan is a preparation created by the Scientific Research Institute of Epidemiology and Microbiology imeni Gamaleya from the O-somatic antigen of typhoid salmonella. It is protein- and lipid-free, is minimally toxic, has highly immunostimulating properties, and has been shown to be effective in tests on monkeys and in limited experimental tests on humans. The researchers found that highly pure salmosan is a powerful activator of the phagocytic cell system in that it amplifies oxygen metabolism in macrophages, spontaneous migration of macrophages and leukocytes, and chemotaxic leukocyte activity. It activates neutrophil precursors in bone marrow, induces the growth of their chemotaxis and spontaneous migration, makes peripheral leukocytes more adhesive, increases total protein content in peritoneal macrophages, and elevates Fc_γ-receptor expression moderately. Salmosan was found to have a marked adjuvant property in the simultaneous administration of 100 μg salmosan and ram erythrocytes, with the number of antibody-forming cells greater than that of control by a factor of 29. However, preliminary administration of salmosan has no effect on the formation of immune response. The preparation has a definite capacity for replacing T-helpers. The fact that optimum doses of salmosan did not cause appreciable changes in the formation of transplantation immunity in different versions of the experiment indicates that the preparation does not amplify transplantation cellular immunity. Unfortunately, when administered without standard adjuvants, salmosan caused a typical delayed hypersensitivity reaction in single immunizations of

experimental animals. Salmosan is considered a promising immunomodulator and is undergoing clinical tests. Figures 3, references 15: 11 Russian, 4 Western.

UDC 616.9215-092.9:612.017.11

Effect of Brucellosis Vaccine on Specific and Nonspecific Viral Immunity in Experimental Animals

907C0406F Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 9, Sep 89 pp 27-30

[Article by N. V. Pak, K. S. Doskhozhayev, R. D. Aspetov and M. G. Bostandzhyan, Scientific Research Institute of Epidemiology, Microbiology and Infectious Diseases, Alma-Ata; Chair of Microbiology, Turkmen Order of People's Friendship State Medical Institute]

[Abstract] Previous demonstration that a brucella vaccine acts as an interferon inducer in mice led to assessment of its effects on specific and nonspecific immunity vis-a-vis influenza A virus (IAV) in outbred mice and guinea pigs. Hemagglutination inhibition studies on mice demonstrated that intraperitoneal administration of 10^9 of the vaccine cells before, concurrently, or after immunization with IAV enhanced the specific antibody response against IAV. Simultaneous administration of both agents led to the highest antibody titers. In addition, since the effect was apparent in the early phase of the immune response against IAV, it appears that stimulation affected primarily the IgM response. The murine studies also revealed that that brucella vaccine potentiated the activity of splenic killer cells by 137 percent. Finally, guinea pig experiments demonstrated that intraperitoneal administration of the vaccine resulted in a two-fold or greater increase in serum activities of nonspecific α-, β- and γ-inhibitors of viral hemagglutination, an effect that persisted for some seven days. These observations suggest that the brucella vaccine should be evaluated as a therapeutic modality in viral infections involving immunodepression. References 8: 6 Russian, 2 Western.

UDC 616.006.81:615.37

Effect of Viral Immunomodulator on T-System Immunity

907C0284B Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 12, Dec 89 (manuscript received 14 Sep 88) pp 108-112

[Article by L. S. Glinkina, R. Zh. Bruvere, and A. Ya. Mutseniyetse, Institute of Microbiology imeni Avgust Kirkhenshteyn, LaSSR Academy of Sciences]

[Abstract] The presence and degree of disturbance in thymus function was studied in malignant skin melanoma patients. In addition, the corrective action of an original viral immunomodulator, developed by the Kirkhenshteyn Institute of Microbiology, on thymic function in the patients was investigated. Twenty-five patients who has undergone surgery for skin melanoma were compared to 46 healthy controls. The quantity of T-lymphocytes in peripheral blood and their in vitro reaction with thymalin were measured using the ram erythrocyte rosette formation method. The average quantity of active T-lymphocytes was depressed in the patients and elevated in controls who had regular contact with oncology patients. In all groups, immunomodulator administration increased T-lymphocyte levels. Thymalin did not cause any change in T-lymphocyte levels in healthy controls; 73 percent of subjects with benign neoplasms reacted similarly. In 9 percent of the subjects with benign neoplasms thymalin caused an increase in T-lymphocytes, indicating a previous deficiency, while in 18 percent a decrease was observed, indicating the presence of terminal lymphocytes in circulating blood. Immunomodulator administration to melanoma patients decreased the percent of subjects not reacting to thymalin from 33.5 percent to 21.8 percent, and the number of subjects showing increased levels of T-lymphocytes with thymalin from 55.5 percent to 43.5 percent. The data indicate that immunomodulator increased the quantity of thymalin-sensitive, functionally-active lymphocytes in healthy controls, but increased the levels of terminal lymphocytes many in melanoma patients. This difference was most common in patients who evidenced metastases or recidivism. Figures 4; references 18: 12 Russian, 6 Western.

UDC 615.371:579.842.14].03.07

Field Trials with Oral Acellular Shigella Flexneri Vaccine

907C0441A Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 10, Oct 89 (manuscript received 14 Jul 88) pp 54-59

[Article by V. V. Sergeyev, L. S. Kreynin, S. I. Yelkina, K. G. Kaverina, L. A. Levina, Ye. V. Zaytseva, L. I. Pavlova, N. M. Nikityuk, P. M. Kholobnykh, Ye. F. Baranov, A. P. Boroday, N. I. Sinyashin, G. S. Ismatova, N. G. Kalina, V. F. Bulk, and V. V. Goryunov, Scientific Research Institute for Vaccines and Sera imeni I. I. Mechnikov, USSR Academy of Medical Sciences, Moscow]

[Abstract] The reactogenicity, safety and prophylactic activity of a new acellular vaccine produced from *S. flexneri* 2A antigenic complexes was studied in two epidemiological trials. The trials were conducted in 1985—one in the UzSSR, Komi ASSR and Transcaucasus, and the other in the Kazakh SSR. Subjects were males aged 18-25. Three daily oral doses of 50 mg active substance were given initially, followed by a single dose one month later in the first trial. Elevated body temperatures and gastrointestinal reaction rates were the same in those receiving the vaccine and placebo. The vaccine had no negative effects on liver or kidney function. Occurrence of hepatitis and acute respiratory infections

was the same in the experimental and control groups. Immunization did not increase serum hemagglutinin levels. Vaccination caused significant decreases in the morbidity rate from *S. flexneri* 2A dysentery, with the greatest effect seen in those regions with the highest levels of disease. Effectiveness coefficients ranged from 62 percent to 100 percent. The second trial, in which the booster dose was not used, gave lower vaccine effectiveness results. No effect was seen on disease caused by other *Shigella* strains. Vaccine-conferred immunity was observed three months after vaccination, but not five months after vaccination. References 18: 11 Russian, 3 Hungarian, 7 Western.

UDC 612.112,94,612,603

Myelopeptides Retard Development of Hereditary Macrocytic Anemia in W/W^v Mice

907C0368D Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 310, No 1, Jan 90 (manuscript received 13 Apr 89) pp 247-249

[Article by R. V. Petrov, N. A. Kompaniyets, V. M. Manko, and A. A. Mikhaylova, Institute of Immunology, Moscow]

[Abstract] The correction of genetically-determined macrocytic anemia in W/W^v mice using myelopeptides was investigated. The effectiveness of the myelopeptides was evaluated on the basis of quantity of hemoglobin in the peripheral blood and function of hemogenic precursor cells in the spleen. In 10 anemic mice with initial hemoglobin levels of 55-100 g/L, administration of myelopeptide increased average hemoglobin level from 82 to 125 g/L, close to that of normal mice. The myelopeptides were administered in one dose of 300 μg every in 10 days and in doses of 100 μg every three days. Myelopeptide also increased the quantity of granulocytic colonies in the spleen by a factor of 2.5-3, and the quantity of erythro-granulocytic colonies by a factor of 9-10. Two injections of myelopeptide, one 300 μg and one 100 μg, also increased the quantity of erythroid colonies in the spleen by a factor of 10. The data indicate that myelopeptides influence the course of genetically-determined macrocytic anemia, by strengthening the function of hemogenic cell precursors. Figures 1; references 6: 4 Russian, 2 Western.

UDC 616.98:578.833.26]-02:615.371(571.63)

Effectiveness of Vaccination and Serotherapy for TBE in Maritime Kray

907C0441B Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 10, Oct 89 (manuscript received 19 Sep 88) pp 59-64

[Article by G. N. Leonova, Scientific Research Institute of Epidemiology and Microbiology, Siberian Otdel, USSR Academy of Medical Sciences, Vladivostok]

[Abstract] In order to resolve questions about the effectiveness of vaccines and serotherapy in tick-borne encephalitis, published data and that obtained by the author from 1960 to 1980 was analyzed. The disease was more prevalent, serious and lethal in persons over 60 years of age, regardless of whether serotherapy was used. Serotherapy is indicated only in focal encephalitis in patients 20 years of age or under. The negative effect of serotherapy in patients over 40 years old is connected with the natural decrease in primary mechanisms for protection from foreign antibodies which has been noted in indigenous residents of the Maritime Kray. Analysis of the effectiveness of cell-culture-derived vaccine from 1966 to 1984 indicated that 9.9 percent of patients with TBE had been vaccinated. Severity of clinical manifestations and outcome were identical in vaccinated and unvaccinated patients. A new, highly purified, lyophilized vaccine which was developed by the Institute of Poliomyelitis and Viral Encephalitis, USSR Academy of Medical Sciences, appeared to be more effective in a small trial, but has not been widely used in the kray to date. Since 1984 a liquid cell culture derived vaccine prepared from the highly immunogenic 205 strain has been used, but several cases of TBE in people vaccinated with this vaccine have already been reported. The lack of effectiveness of the vaccines is due to the highly virulent strains found in the region and the low indices of humoral nonspecific resistance factors found in the population. The results indicate that prevention and treatment of TBE can be improved by considering the age and immunological status of the subject, and the optimum time of year for antibody formation. Figures 1; references 25: Russian.

UDC 616.94-02:615.382]-07:612.017.1

Effect of Immune Antibacterial Plasma and Donor Leukomass on Immune System in Patients with Purulent Septic Processes

907C0441E Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 10, Oct 89 (manuscript received 11 Apr 88) pp 91-96

[Article by G. V. Bulayeva, L. K. Zdanovskaya, and T. I. Titova, Scientific Research Institute of Emergency Medicine imeni N. V. Sklifosovskiy, Moscow]

[Abstract] The effect of administering immune antibacterial serum or donor leukocyte mass to 112 patients suffering from purulent septic processes was studied. Immune plasma was prescribed during acute intoxication with no increase in specific antibody titer in the patient in the presence of *S. aureus, P. aeruginosa* or *P. mirabilis* antigen exceeding threshold levels by a factor of 3-4. The sera were obtained from donor volunteers who were immunized with corpuscular pyocyaneus vaccine, Proteus vaccine or adsorbed staphylococcal anatoxin. Leukocyte mass was used in the absence of effect from traditional treatments, including antibiotics, and

immune leukocyte or monocyte therapy. Both treatments stimulated humoral and cellular immunity. Quantity of T-lymphocytes increased, B-lymphcyte immunoglobulin production was enhanced, neutrophil phagocytic activity increased, and beta-lysine levels normalized in response to immune plasma. Bacterial antigen levels decreased by a factor of 3-8, while specific antibody levels increased. Administration of leukocyte mass caused changes in the immune system similar to those elicited by immune plasma. In these patients, pretreatment leukocytosis and marked lymphopenia normalized after treatment. The similarity of the two treatments is due to the presence of regulatory mediators in both preparations, which influence immunogenesis in the same direction. Treatment with immune plasma or leukocyte mass is recommended for patients with purulent septic processes accompanied by below-normal cellular immunity. References 16: 12 Russian, 4 Western.

UDC 616.98:576.862.1:579.253]-078.73

Immunostimulatory Activity of STP

907C0441G Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 10, Oct 89 (manuscript received 5 Oct 88) pp 112-113

[Article by Ye. I. Titova, S. Ya. Savranskaya, S. Ye. Yesipov, Yu. I. Sibrikov, N. M. Landsman, and V. K. Golshmid, Scientific Research Institute for Vaccines and Sera imeni I. I. Mechnikov, USSR Academy of Medical Sciences; All-Union Scientific Research Institute of Antibiotics, Moscow]

[Abstract] STP, a biologically-active substance isolated from the culture fluid of Streptococcus sp. TOM-1606, was tested for immunostimulatory adjuvant activity as compared with that of Freund's adjuvant. The STP was prepared as an emulsion in petrolatum oil and Tween-80, which was mixed with an equal volume of normal saline before administration. The protective protein fraction obtained from the disintegration of *Bordetella pertussis* and mouse gamma globulin served as antigens. Testing was conducted in 96 chinchilla rabbits, who were administered three injections at four-day intervals, followed 30 days later by six injections at four-day intervals. The rabbits were bled seven days after the last injection, and antibody titers were determined by enzyme immunoassay. In response to the *B. pertussis* antigen, STP increased the antibody titer by factors of 4-8, which was about double the effect of Freund's adjuvant. In response to mouse gamma globulin, STP produced titers that were larger by a factor of 2-4 than those produced by Freund's adjuvant. The data indicate that STP is at least as active as Freund's adjuvant.

UDC 616.15-085.38

Significance of Typology of Nervous System for Selecting Donors as Producers of Anti-Staphylococcus Plasma and Gamma-Globulin

907C0460B Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 11, Nov 89 (manuscript received 6 Jun 88) pp 20-21

[Article by M. E. Krakovskiy, A. A. Buklovskaya, I. M. Alayev, and M. K. Yusupova, Scientific Research Institute of Hematology and Blood Transfusion, UzSSR Ministry of Health]

[Abstract] The connection between the production of staphylococcus antibodies and the typology of the nervous system in people immunized to produce anti-staphylococcus plasma was studied. Of the 54 healthy plasma donors observed, 56 percent had a strong-type nervous system. In those people, the antibody titer was much greater than in those with the weak-type nervous system. It is likely that the higher energy supply to tissues, including the blood, in strong-type representatives is also due to the high-level immune response of their bodies. Studying the typology of the nervous system of donors reveals perspectives for further improvement of vaccine-sera work. Determining the typology of the nervous system of donors is recommended as a test for selecting people as anti-staphylococcus plasma and gamma-globulin producers, which would significantly increase the labor productivity of personnel in blood transfusion centers. References 7 (Russian).

UDC 578.891:578.74].083.3

Radioimmunoassay Technique Based on Anti-idiotypic Antibodies for Identifying Surface Antigens of Hepatitis B Virus

907C0429C Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 10, Oct 89 (manuscript received 2 Aug 88; after revision 11 May 89) pp 41-45

[Article by I. D. Kholodnyuk, R. A. Kukayn, Institute of Microbiology imeni A. Kirkhenshtein, Latvian SSR Academy of Sciences, Riga]

[Abstract] Idiotopes (Id) are unique antigenic determinants inside and around antigen-binding sections (paratopes) of an immunoglobulin G molecule that distinguish some antibodies from others. An idiotype is made by combining all the idiotopes that are in the variable sections of the immunoglobulin molecule and are capable of causing antibody formation following immunization. Anti-idiotypic antibodies are being used for analysis of receptors, in diagnosing and assessing autoimmune diseases, as immunogens and vaccines, and for creating antigen-independent immune diagnosis

techniques. The work reported here involved the development of a new antigen-independent radioimmunoassay technique that is based on the HBsAG inhibition of the interaction between idiotypic anti-HBs and anti-Id AT antibodies. Competitive radioimmunoassay was performed using a labeled isotope of HBsAg and polyclonal anti-HBs from humans, rabbits, and guinea pigs. Specific immunologic determination of antigens is possible by using heterologic [^{125}I]-anti-Id antibodies. The liquid-phase antigen-independent RIA demonstrated a sensitivity of 80-100 ng/ml HBsAG, which is greater than the sensitivity of traditional EIA and RIA by 1-2 orders of magnitude. Figures 5, references 27: 2 Russian, 25 Western.

UDC 617-089.168-06:[617-001.4-002.3-084:615.849.19]-092.9

In Vitro Trials with Carbon Dioxide Laser in Prevention of Surgical Wound Infection

907C0840D Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 109 No 5, May 90 (manuscript received 24 Feb 89) pp 456-457

[Article by I. A. Kurbanov, Scientific Research Institute of Laser Surgery, USSR Ministry of Health, Moscow]

[Abstract] In-vitro and in-vivo trials were conducted with CO_2 Skalpel-1 laser in assessing its utility in controlling surgical wound infections. Petri dish studies demonstrated that an energy of 21.4 J/cm^2 was sufficient for killing E. coli, Ps. aeruginosa, S. aureus, and B. subtilis. In addition, studies with deliberately infected open cutaneous wounds with these microorganisms performed on male Wistar rats demonstrated that a 2.5 J/cm^2 dose was sufficient for sterilizing wounds infected with the nonsporogenic bacteria; B. subtilis, however, requires a dose of 10.6 j/cm^2. In chronic experiments the wound was infected with E. coli, covered with a skin flap, and then the surface irradiated with 10.6 J/cm^2 dose. In all cases laser treatment was seen to facilitate more rapid healing and elimination of the bacterial contaminants. The lower laser intensities required in-vivo as opposed to in-vitro findings were due to the fact that in the former case the bacteria were also subjected to the action of immune mechanisms. References 12: 4 Russian, 8 Western.

UDC 617.723+617.735-085.849.19:612.085.1

Laser Contact-Compression Transscleral Coagulation of Eye Fundus Tissue

907C0481A Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, 1989 (manuscript received 26 Sep 88) pp 362-364

[Article by L. A. Linnik, A. P. Privalov, P. P. Chechin, G. I. Zheltov, and Yu. L. Tverskoy, Odessa Order of the Red Banner of Labor Scientific Research Institute of Eye Diseases and Tissue Therapy imeni Academician V. P. Filatov]

[Abstract] Attempts to improve transscleral laser coagulation techniques have made it possible to develop basic recommendations for using laser radiation with strictly defined parameters (wavelength, pulse duration, divergence, and energy). The use of monofiber probes to transmit the radiation through the sclera simplifies transscleral therapy techniques. Compressing the monofiber into the sclera changes its optico-physical characteristics, causing a substantial increase in its transparency due to the pressing out of the interstitial fluid. Ruby, YAG/neodymium, and helium-neon lasers adapted with monofiber probes were used to assess contact transscleral techniques on 40 chinchilla and Flemish rabbits and rhesus macaque monkeys. Marked clarification of the sclera occurs 5-10 seconds after depression begins. Results show that the coagulation threshholds of the eye fundus tissue were lower when transscleral laser radiation with a monofiber was used than were the coagulation threshholds when transpupil techniques under identical conditions were used. That indicates heavier absorption of radiation by the pigmented structures of the eye in the compression area. Much lower coagulation threshholds were obtained with transscleral methods than with transpupil techniques on monkeys when the yttrium-aluminum-garnet/neodymium laser was used. The results show that this technique significantly increases the feasibility of using transscleral techniques on the inner eye structures. References 10: 6 Russian, 4 Western.

UDC 617.741-004.1-021.5-089.849.19

Modified Argon Laser Discission of Secondary Cataracts With Use of Abrakham Contact Lens

907C0481B Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, 1989 (manuscript received 29 Sep 88) pp 378-379

[Article by V. V. Bakutkin and D. L. Baskov, Department of Eye Diseases, Saratov Order of the Red Banner of Labor Medical Institute]

[Abstract] Ophthalmologists are able to use lasers to dissect secondary cataracts by radiation. Ruby and yttrium-aluminum-garnet lasers that operate in a pulsed mode are most often used for such purposes. Since 1986, Abrakham lenses have been used with laser treatment of secondary cataracts. This contact lens has an attachment which focuses the laser beam. After the cornea is anesthetized, the Abrakham contact lens is placed on it. The laser beam of an argon ophthalmocoagulator is focused on the secondary cataract at a 40-45° angle in relation to the optic axis of the eye. Dissection of the secondary cataract is usually performed in one treatment. The advantage of using the Abrakham lens for laser discission of secondary cataracts is that thinning of the beam occurs beyond its focus, and the amount of light energy on the eye fundus and macular region is decreased. Thirty men and women were treated using this technique. There were no complications during the operations or during a period of up to one year afterwards.

UDC 617.735-007.17:615.849.11

Pulsed Electromagnetic Field in Treatment of Dystrophic Lesions of the Retina

907C0482A Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 8, 1989 (manuscript received 15 Aug 89) pp 459-462

[Article by A. V. Skrinnik and A. S. Kovalchuk, Odessa Order of the Red Banner of Labor Scientific Research Institute of Eye Diseases and Tissue Therapy imeni Academician V. P. Filatov]

[Abstract] An apparatus and radiating element for a pulsed electromagnetic field were developed and manufactured for use in ophthalmology which make it possible to create a quasi-uniform field zone. The main result of this research was the establishment of reliable objective data in favor of the biological activity of the pulsed electromagnetic field and substantiation of its biotropic parameters for therapeutic purposes. The therapeutic effect of the pulsed electromagnetic field was tested on patients with dystrophy of the macula lutea, one of the more serious forms of visual pathology. The field's rate of induction was 2 x 10^4 mT/sec, with an 8.5 mT amplitude and a 50Hz pulse tracking frequency. The course of pulsed electromagnetic field therapy consisted of 7-10 treatments, of which the first four or five were uninterrupted. Treatment was performed on 177 patients aged 40-60 years who had had the disease from 6 months to 10 years and had received medications and physiotherapy. Pulse electromagnetic field therapy stabilized the pathological process of maculodystrophy, without any complications. Rheographic indices improved considerably after treatment. Results indicate that it is necessary to conduct repeat courses of treatment every 3-5 months to maintain the results and prevent the development of complications. Figure 1, references 9: 6 Russian, 3 Western.

UDC 616.36-002.1-099.085.849.19-036.8:616.36-091

Morphological Assessment of Preventive and Therapeutic Action of Low-Intensity Laser Radiation on Course of Acute Toxic Hepatitis

907C0477B Moscow ARKHIV PATOLOGII in Russian Vol 51 No 12, Dec 89 (manuscript received 16 Jan 89) pp 28-32

[Article by S. B. Barakayev, G. K. Mirodzhov, and Z. G. Mishanina, Gastroenterology Institute, Tajik SSR Academy of Sciences]

[Abstract] The preventive and therapeutic effect of low-intensity laser radiation on the course of experimental acute toxic hepatitis caused by CCl_4 was studied. Carbon tetrachloride in cottonseed oil was injected in 210 white rats in a rear paw every other day. The animals were divided into three groups. Group one received only CCl_4. Group two received both CCl_4 and laser irradiation of the epigastric area. Group three received CCl_4 for 1 month and began daily treatment with the helium-neon laser a day after the last injection. The animals' livers were studied morphologically after 1, 3, 5, 7, 10, and 12 radiation treatments. Structural changes in the liver depend on the intensity and duration of irradiation. Irradiation with the helium-neon laser at 3 mW/cm^2 for 3 and 5 minutes does not affect the morphology of acute toxic hepatitis. Early signs of reduction in the severity of hydropic dystrophy of the hepatocytes and necrotic changes in the parenchyma occur when the irradiation time is extended to 10 minutes. Helium-neon laser irradiation for 5-10 minutes at 5-10 mW/cm^2 has the maximum preventive effect on the course of acute toxic hepatitis. The positive therapeutic effect of the helium-neon laser was noted by the day 7 of treatment, which was reflected in the reduction of the degree of protein and adipose dystrophy of the hepatocytes and in the decrease in necroses in the parenchyma and intensity of inflammatory infiltration in the portal and intralobular stroma. By the day 10 of treatment, the liver was almost back to normal. Some possible mechanisms of the preventive and therapeutic effect of the helium-neon laser on acute toxic hepatitis were suggested. This effect is tied to increasing the regenerating activity of the hepatocytes, suppressing the oxidation of lipids, and improving metabolic processes. References 10: 6 Russian, 4 Western.

UDC 616.831-089.166:615.849.19

Substantiation for Using CO_2-Laser in Brain Surgery

907C0477A Moscow VOPROSY NEYROKHIRURGII in Russian No 6, Nov-Dec 89 (manuscript received 1 Feb 88) pp 50-54

[Article by Ye. I. Babichenko, V. N. Kolesov, A. P. Zhikharev, S. N. Grigoryev, V. A. Tsukanov, S. O. Gorelik, and A. G. Anoshin, Department of Neurosurgery, Central Scientific Research Laboratory, Saratov Medical Institute; Saratov City Clinical Hospital of Emergency Medicine imeni V. I. Lenin]

[Abstract] Experimental research involving the condition of local cranial blood flow, thermodynamics and morphology of the zone of irradiation, and dynamics of the energy indices of the brain and its edema was performed in a study of the nature of the effect of CO_2-laser radiation on brain structures. The Skalpel-1 laser was used as the energy source. The various experimental studies were performed on cats, rabbits, and rats. One of the main advantages of using lasers for neurosurgery is that it enables the surgeon to gradually remove sections of pathlogical tissue with the least amount of trauma to nearby brain structures. The research data makes it possible to predict the likelihood and degree of expression of possible complications. The CO_2-laser Skalpel-1 was used in 109 operations on the skull and brain. The possibility of using the laser to remove tumors inside the brain is of great interest. In the post-operative period, use of the laser is not accompanied by an increase in neurological prolapses, and edema is diminished. Hyperthermia is insignificant and temporary. Scar tissue does not form where the CO_2-laser is used. The CO_2-laser is irreplaceable because of its good hemostatic effect and sterility. Figures 2, references 16: 8 Russian, 8 Western.

UDC 617-001.4+616-002.44-009.85]-085.849.19-036.8

Experimental and Clinical Substantiation of Laser Therapy for Wounds and Trophic Ulcers

907C0459B Moscow ORTOPEDIYA, TRAVMATOLOGIYA I PROTEZIROVANIYE in Russian No 10, Oct 89 (manuscript received 1 Feb 89) pp 66-70

[Article by A. P. Rakcheyev and Yu. V. Kiprenskiy, Transplants and Artificial Organs Scientific Research Institute; Central Dermatovenereology Institute]

[Abstract] The number of helium-neon laser proponents is increasing yearly in surgical and traumatological practice. The researchers here studied the biostimulating effect of laser radiation on the reparative regeneration, and they sought to determine the mechanism of the therapeutic effect. Replantation of a posterior limb was performed on 60 male guinea pigs; 70 percent of the wounds developed into trophic ulcers. Trophic ulcers were produced in rabbits by five injections of equine sera made every 5 days. Excision of a section of skin and the subcutaneous layer and the adjoining muscle was then performed, and equine sera was injected again. The trophic ulcers appeared a few days later. The animals in three of the experimental groups were radiated with the helium-neon laser on a daily basis. The healing process of the wounds and ulcers was assessed. The wounds treated with the laser had relatively fewer destructive changes in the surrounding tissue, a clearer line of demarcation of the swelling, and granulation tissue. In the laser-treated wounds, fibroblasts were oriented into bundles, there was new formation of the collagenous fibers, and there was active proliferation of the epidermis around the edges. An increased content of lysosomal enzymes contributed to the rapid cleansing of the necrotic tissue from the trophic ulcers and an increase in the permeability of the vessels near the trophic ulcer. It was shown that laser therapy accelerated regenerative processes. Laser therapy was then tested on 56 people for 25-30 procedures lasting five minutes each. The patients did not receive any other medications except lotions and lineaments. Laser therapy was also used on 38 patients with injuries to arterial blood vessels, nerve trunks, muscles, and tendons prior to and after reconstructive surgery to improve microcirculation, and to increase the movement in the joints, as well as accelerate the regenerative processes. Laser therapy has an anti-inflammatory effect, contributes to the rapid development and maturation of the granulation tissue, and accelerates proliferation of the epidermis. Helium-neon laser therapy does not cause any local or general side effects or complications. It can be used as a non-specific physical factor for activating the processes for regenerating wounds and trophic ulcers. References 9 (Russian).

UDC 57.018+599.745:616-092

Quantity and Composition of Bacteria on Skin of Marine Mammals as Indicator of Animals' Physiological Condition

907C0417D Moscow MIKROBIOLOGIYA in Russian Vol 58 No 5, Sep-Oct 89 (manuscript received 23 Nov 87) pp 864-870

[Article by N. A. Ushakova and O. Yu. Abramova, Institute of Evolutional Morphology and Ecology of Animals imeni A. N. Severtsov, USSR Academy of Sciences, Moscow]

[Abstract] Functional changes occurring in the bodies of rabbits, rats, guinea pigs, monkeys, and dogs are accompanied by characteristic alterations of microbial population on their skins. In general, the number of bacteria is increased, coliforms appear along with hemolytic and mannite-decomposing bacteria. The purpose of the work reported here was to study the characteristics of bacterial colonies on selected sections of the skin of Black Sea bottle-nosed dolphins and northern fur seals during their adaptation to captivity and in relationship to their health. When the animals were kept in the same pool, Staphylococcus, Micrococcus, Bacillus and Pseudomonas were found on the hairless sections of their bodies, regardless of species, sex or how the animals were housed. In addition, dolphins were found to carry Lactobacillus. The composition of bacterial species on the test animals was a function of quantity of bacteria in the water and of the functional state of the hosts. Bacteria increased in numbers on animals suffering from disease, trauma or stress. Figures 1; references 11: 9 Russian, 2 Western.

UDC 617.713-002.9-085

New Technique In Treatment of Keratites of Pyocyanic Etiology

907C0482C Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 8, 1989 (manuscript received 17 Feb 89) pp 490-492

[Article by V. N. Sakovich, Department of Eye Diseases, Dnepropetrov Medical Institute]

[Abstract] Activated charcoal fibrillar material sorbents were used with antibacterial preparations for the purpose of finding new, effective methods of treating purulent, inflammatory diseases of the retina. It has been used in medical practice since July 1988, but no data has yet been found on the use of the charcoal sorbent in the treatment of purulent keratites. Twenty-three patients (23 eyes) aged 8-76 years with pyocyanic keratites were observed. Included in the treatment of those patients was the use of activated charcoal fibrillar material that was applied to the afflicted retina and held in place by a soft contact lens. The bandage was applied for 8-10 hours the first day, then 10-12 hours for 7-8 days. Frequent instillation of antibacterial preparations continued during this time. The purulent process was arrested in over 90 percent of the experimental patients, while it was arrested in only 63 percent of the patients in the control group. Visual acuity improved by 78.2 percent in the experimental group, as opposed to 57.8 percent in the control group. This method is recommended for treating purulent keratites and makes it possible to decrease the period for treating patients in the hospital, avoid surgery in over 90 percent of cases, and save the eye in serious cases of keratitis. References 9: 7 Russian, 2 Western.

UDC 615.362.75

Artificial Synovial Fluid for Joints

907C0459A Moscow ORTOPEDIYA, TRAVMATOLOGIYA I PROTEZIROVANIYE in Russian No 10, Oct 89 (manuscript received 26 Jun 89) pp 11-15

[Article by V. V. Vasilenkaytis, Laboratory of Experimental Therapy, Oncology Institute, Vilnius]

[Abstract] An artificial synovial fluid based on medical polymers and biopolymers has been developed for intra-articular administration with the goal of introducing it into medical practice and organizing the industrial production of it. The artificial synovial fluid imitates the multi-component system for lubricating the joints, replenishes a shortage of natural synovial fluid in the joints, and stops the progression of pathological processes in the joints. An artificial synovial fluid with polyvinylpyrrolidone is now being used for intra-articular treatment. An artificial synovial fluid based on polyvinylpyrrolidone is most like natural synovial fluid in its rheological, structural, and lubricating properties. Models of a number of pathological joint processes were developed for studying their pathogenesis and the basis of methods of correct treatment for the joint. Rabbits in which various joint disorders were induced were used to test the artificial synovial fluid. Various intra-articular, local, and combined treatments were used on 514 patients with rheumatoid arthritis, osteoarthrosis, Reiter's syndrome, etc., to test the basis and methods of the clinical use of artificial synovial fluid. Intra-articular treatment with artificial synovial fluid improved many indices of joint functions, and a positive change in the laboratory, biochemical, and immunological indices was noted. The use of artificial lubricants based on polyvinylpyrrolidone reduces inflammation and helps eliminate antigens, metabolites, and toxins from the joint, improve microcirculation and metabolism in it, and restore the joint's own lubricating system. Results of a survey taken 1-10 years after intra-articular treatment showed that 86.5 percent of the patients had long-term improvement of joint functions, work capacity, and general condition. References 17: 13 Russian, 4 Western.

UDC 615.477.2.038:616.126.3-089.843-77

Clinical Description of Domestically Produced EMIKS and LIKS Low-Profile Cardiac Valves

907C0395A Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 10, Oct 89 (manuscript received 27 Feb 89) pp 68-75

[Article by G. I. Tsukerman, N. B. Dobrova , D. O. Taminskiy, L. V. Pomortseva, I. N. Gvakhariya, N. A. Chigogidze, Yu. V. Zaretskiy, Institute of Cardiovascular Surgery imeni A. N. Bakulev, USSR Academy of Medical Sciences, Moscow]

[Abstract] Two new low-profile cardiac valves EMIKS and LIKS were developed in the USSR in the early 1980s. They are similar to those made by Bjork-Shilley, Omniseins, and Sorin in terms of their principle of operation. Clinical assessment of the valves was based on data of 348 patients implanted with artificial mitral and/or aortic valves. Acute cardiac insufficiency in the first three days following the operation occurred in less than 5 percent of the patients. Three others, two of which died, experienced thromboembolic complications. Of the 348 patients, 20 died. Comparative analysis of EMIKS and LIKS showed that they are as good as the Bjork-Shilley and Medtronic-Xall devices, and among the best by world standards. The non-fatal complications and hospital fatalities were not associated with the design of new valve devices. When implanting the disks into the mitral position, it is important to carefully resect the structures associated with the valve and to not use a valve that is so large it jams the closing element. The patients with these devices have a high survival rate. Figures 4, references 15: 10 Russian, 5 Western.

UDC 616.12-089.163/168-07:[002:65.01.56

Computer-Based Diseases History System in Cardiac Surgery Clinic (Five Years of Experience)

907C0395B Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 10, Oct 89 (manuscript received 27 Feb 89) pp 90-96

[Article by V. L. Stolyar, V. V. Begtin, N. A. Kotov, A. O. Petrov, N. G. Chadayev, A. V. Sheshukov, Institute of Cardiovascular Surgery imeni A. N. Bakulev, USSR Academy of Medical Sciences, Moscow]

[Abstract] During the past decade in the USSR and abroad, a great deal of experience has been gained in the use of the computer to collect and analyze information on surgical and intensive-care patients, in laboratories and surgery departments, and in hospital management. A computer-based disease history system for three pediatric departments at the Institute of Cardiovascular Surgery was set up in 1983. The system collects, stores, processes, displays, and analyzes patient information and is used every day by more than 450 clinical workers at some 50 terminals. The design of the system is based on the use of modern computer technology, complete coverage of the treatment process, use of a physician-computer dialog mode, location of terminals in all subunits, data protection and security, and a flexible software and hardware structure. By 1990, the system will include all the surgical departments of the clinic. Results of the examination and treatment of patients are entered into the computer on a daily basis. The system is based on a local COMNET network that combines four 16-bit multiprocessor MIKRON microcomputers, more than 50 terminals, and six PCs. The software is based on INFO-2000 and dBASE III+ packages. MICROSTAT, STATGRAPH, and FOSS are used for processing and display. Various packages that use Pascal, SI, Assembler, BASIC, and PROLOG have also been developed for the system. The structure of the is described. The computer has been very effective in improving the organization of treatment and in research in the cardiac surgery clinic. Figures 2, references 7: 4 Russian, 3 Western.

UDC 616.98:579.887.9]-078.73

Monoclonal Antibodies to Legionella Pneumophila Cytolysin

907C0441D Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 10, Oct 89 (manuscript received 12 Oct 88) pp 83-87

[Article by S. V. Spitsyn, O. I. Barkhatova, E. I. Drobyshevskaya, Yu. F. Belyy, I. S. Tartakovskiy, V. G. Nesterenko, and S. V. Prozorovskiy, Scientific Research Institute of Microbiology imeni N. F. Gamalya, USSR Academy of Medical Sciences, Moscow]

[Abstract] Monoclonal antibodies to the pathogenic, species-specific *L. pneumophila* protein cytolysin were elaborated. BALB/c mice were immunized with purified cytolysin and their spleen cells fused with Sp-2/0 or NP plasmacytes. Initiala EIA screening of the hybrids yielded 97 clones with a positive reaction to cytolysin. Ten were chosen for further study, of which four produced IgG1 antibody, four IgG3, and two IgM. Six exhibited hemagglutination. All gave one precipitation line with *L. pneumophila* lysate, but not with purified cytolysin, which may be due to differences in degree of aggregation. Electrophoresis showed that the IgG antibodies interacted with a 37 kD protein, which corresponded to the mass of cytolysin. Conjugation of one IgG1 and one IgG3 to horseradish peroxidase established that the antibodies interact with 37 kD protein and smaller components produced by autolysis. The antibodies did not react with lysate from other *Legionella* species. Two of the antibodies were also shown not to react with a species-specific 29 kD outer membrane antigen from *L. pneumophila.* Antibody V6/3 was conjugated with fluorescene isothiocyanate and shown to react with the *pneumophila,* but not the *bozemanii, dumoffii* or *longbeachae* strains. This conjugate may be used for rapid diagnosis of Legionaire's Disease. References 16: 7 Russian, 9 Western.

UDC 595.771

Concerning the State and Prospects of Developing Biological Methods of Control of Harmful Invertebrates of Medical and Veterinarian Importance

907C0496A Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA BIOLOGICHESKAYA in Russian No 6, Nov-Dec 89 pp 3-8

[Article by A. M. Dubitskiy, Institute of Zoology, KaSSR Academy of Sciences]

[Abstract] A summary of prospects of developing biological methods of invertebrate pest control included an analysis of the scientific and personnel situation in this area in the USSR and recommendations for further study. Recommendations for future studies included intensification of isolation of new strains of spore-forming bacteria and other pathogens, checking newly isolated and some "old" strains for as large as possible spectrum of harmful insects, expansion of laboratory cultures of the object of control, coordination of studies for isolating new strains of pathogens and checking them for diverse groups of insect pests, development of priority trends for molecular biology and genetic engineering and creation and use for development of biological methods of control of invertebrate pests on the basis of the strategic plan of the World Health Organization. In the USSR, some research in this area is carried out by the All-Union Order of Lenin Academy of Agricultural Sciences imeni V. I. Lenin [VASKhNIL] and USSR Agro-industry and (in descending order) by the USSR Ministry of Medical and Biological Industry, USSR Academy of Sciences, USSR Ministry of Colleges and USSR Ministry of Health. Most (92-95 percent) of the research involves development of biological means of control of farm pests and weeds and only 5-8 percent involves development of biological control of medically important pests. This research is being carried out, for the most part, in republican branches of USSR Academy of Sciences, USSR VASKhNIL, Ministry of Medical and Biological Industry, partially by USSR Ministry of Colleges and minimally by USSR Ministry of Health and USSR Academy of Medical Sciences. The work involves only 7-10 percent of scientists of these groups, who are poorly equipped and financed. This gap in Soviet science was lessened in 1986 by a proposal of the World Health Organization which, with agreement of superior organizations (including the presidium of the USSR Academy of Sciences), organzied, at the KaSSR Academy of Sciences Institute of Zoology (at the laboratory of biological control of invertebrate pests), the International Collaboration Center of the World Health Organization on Biological Control of Disease Carriers. In addition to producing fresh information and samples of foreign preparations, the center coordinates this research in the USSR and trains Soviet and foreign specialists. The KaSSR Academy of Sciences Institute of Zoology, under the aegis of this center, receives nearly $20,000 annually from the World Health Organization for the purchase of modern equipment and scarce reagents for conducting additional work in assessing existing and developing new micropathogens for control of disease carriers.

UDC 620.193.82:771

Microscopic Fungi—Biodestructors of Photographic Films

907C0383B Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 23 No 5, Sep-Oct 89 (manuscript received 22 Mar 89) pp 430-433

[Article by I. A. Yermilova, A. L. Kartuzhanskiy, Ye. I. Pekhtasheva, G. V. Potina and I. G. Kanevskaya, Leningrad Institute of Soviet Trade imeni F. Engels]

[Abstract] Photographic and cinemagraphic materials can be destroyed by microorganisms, but data on the species that are capable of that are limited. In the present work, microscopic fungi were isolated in pure culture, and their families and species were identified. Two such film-destroying species were isolated from film surface and were identified as *Aspergillus niger* v. Tiegh and *A. ornatus* Raper, Fennel et Tresner. Studies carried out on films based on polyethylene terephthalate and triacetyl cellulose showed that neither was resistant to those fungi. Overall, it was shown that the fungi attack both the photographic emulsion and the substrate, affecting their optical density. References 4 (Russian).

UDC 581.14:582.288.22

Effect of Various Carbon and Nitrogen Sources on Sporulation of Septoria Tritici Rob. et Desm. in Submerged Culture

907C0383A Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 23 No 5, Sep-Oct 89 (manuscript received 9 Feb 89) pp 422-424

[Article by Ye. P. Davydova, T. F. Kvasnyuk and S. I. Palenkova, All-Union Scientific Research Institute of Phytopathology, Moscow Oblast]

[Abstract] Wheat leaf spot caused by *Septoria tritici* Rob. et Desm. is widespread. One way to control it is to develop resistant varieties from seriously infected fields. It was shown that *S. tritici* is capable of forming conidia even in submerged cultivation. The study was carried out using isolates B-3/8 and B-6/25-2 from the collection of the All-Union Scientific Research Institute of Phytopathology. Molasses proved to be the best choice as a source for carbon nutrients for both isolates: B-3/8 yielded 36 billion conidia per liter, and B-6/25-2, about 23 billion. There were several complex nutrition sources for nitrogen: soy bean, corn and yeast extracts. Optimal nutrient media were established consisting of molasses-corn and molasses-peptone. This method provided conidia yields that exceeded those obtained on potato-saccharose medium by a factor of 7. References 11: 5 Russian, 6 Western.

UDC 632.934.1:631.46

Chlorophenol Degradation With Rhodococcus Erythropolis Culture

907C0417C Moscow MIKROBIOLOGIYA in Russian Vol 58 No 5, Sep-Oct 89 (manuscript received 21 Jun 88) pp 802-806

[Article by S. N. Gorlatov, O. V. Maltseva, V. I. Shevchenko and L. A. Golovleva, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino]

[Abstract] Accumulation of various aromatic chlorine compounds in the environment is a serious problem because of their ability to form polychlorinated condensed structures and their carcinogenic properties. Microorganisms capable of breaking down such compounds are of considerable interest not only as direct destructors of xenobiotics, but also as a basis of genetic-engineering efforts to produce highly active strains for detoxification of especially persistent pollutants. The enzymatic activity of *Rhodococcus erythropolis* strain Icp, capable of breaking down mono-, di- and trichlorophenols, was investigated. Its growth commenced after a long lag phase, while the degradation of chlorophenol was under way somewhat sooner; however, maximum effect coincided with the most active growth. Grown on the chlorophenol, the strain induced formation of pyrocatechase and phenol hydroxylase. Chloropyrocatechols were formed from chlorophenols, and extensive oxidation of mono- and dichlorophenols was observed. It was concluded that the first step in transformation of chlorophenols by *R. erythropolis* Icp was hydroxylation to chloropyrocatechols by phenolhydroxylase followed by ortho cleavage with pyrocatechase. Figures 5; references 8: 2 Russian, 6 Western.

UDC 579.222

Adaptation of Acholeplasma Laidlawii Culture to Toluene

907C0417A Moscow MIKROBIOLOGIYA in Russian Vol 58 No 5, Sep-Oct 89 (manuscript received 5 Dec 88) pp 764-768

[Article by V. M. Govorun, E. T. Mambetisayeva, L. A. Artyushina and A. B. Kapitanov, Scientific Research Institute of Physical-Chemical Medicine, RSFSR Ministry of Health, Moscow]

[Abstract] *Acholeplasma laidlawii* belongs to the simplest microorganisms capable of reproduction on synthetic culture medium. Their unusually high adaptability to changing conditions and their survival in media to which toxic substances have been added have not been adequately studied. Possible adaptation mechanisms of *A. laidlawii* to membranotropic compounds were investigated, and their viability under such conditions was evaluated. The activity of hydroxylase systems determines cell viability because they detoxify the medium. Addition of toluene to an 18-hr culture was accompanied by high specific activity of the hydroxylase and increased synthesis of P-450 cytochrome along with demethylation; this probably was the protective action of *A. laidlawii*. A 10-fold rise of the content of cholesterol in cell membranes could be the result of elevated cell affinity for low density lipoproteins (LDL). It was shown that such an accumulation of cholesterol was enzyme dependent and that the receptor for LDL was represented only by the lipid moiety of the membrane. Figures 4; references 20: 5 Russian, 15 Western.

UDC 577.113.4

Cloning and Nucleotide Sequence of 5'-Flanking Region of Human Interleukin-2 Gene

907C0438D Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 15 No 10, Oct 89 (manuscript received 28 Mar 89) pp 1362-1365

[E. K. Yankevits, G. I. Makarenkova, N. V. Romanchikova, I. O. Muyzhniyeks, A. Yu. Tsimanis, E. Ya. Gren, Latvian State University imeni P. Stucha, Riga; Institute of Organic Synthesis of the Latvian SSR Academy of Sciences, Riga]

[Abstract] Interleukin-2 (T-lymphocyte growth factor) is an important lymphokine that helps regulate the conservative processes of differentiation and proliferation of T-cells. New data about the primary structure of the 5'-flanking region of the human interleukin-2 gene are presented which include information on deletions, insertions, and substitutions. Promoter, terminator, and enhancer regions responsible for regulating transcription were found. Regulator regions that are in the 5'-flanking region of the interleukin-2 gene are presented. Several sections of DNA were found that are homologous with the promoter regions of the interleukin-2 gene. Figures 4, references 13: 1 Russian, 12 Western.

UDC 615.371:578.821.51]:[578.56:577.212.3:575.222.75

Analysis of Structural Proteins and Products of Cell-Free Translation of Vaccinia Virs mRNA by Using Monospecific Antisera

907C0429A Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 10, Oct 89 (manuscript received 5 Jan 89; after revision 28 Mar 89) pp 19-24

[Article by A. I. Muravlev, N. A. Netesova, V. Ya. Tikhonov, E. G. Malygin, All-Union Scientific Research Institute of Molecular Biology, Scientific Production Association Vektor, Koltsovo, Novosibirsk Oblast]

[Abstract] Many studies have been dedicated to introducing foreign genetic information into the genome of the vaccinia virus in order to produce recombinant vaccines. The foreign genes are generally introduced near the thymidine kinase gene. The lack of data on the functional mapping of the virus genome is hindering the development of various eukaryotic vectors based on this virus. There is little data on genetic mapping of the surface proteins of the intracellular virion. Hybrid selection of virus-specific mRNA on fragments of viral DNA, with their subsequent translation in a cell-free protein-synthesizing system and analysis of its products via monospecific antisera or monoclonal antibodies for the structural proteins of the virion is the technique widely used to map vaccinia virus. The researchers performed the first stage of study necessary for subsequent genetic mapping of the basic envelope proteins of the vaccinia virus. The vaccinia virus was extracted from the chorion-allantois of chick embryos. The CV-1 cells were infected in the monolayer with pure viruses at 10-20 PFU/cell. Monospecific antisera were obtained from vaccinated rabbits. There are six major polypeptides in the vaccinia virus envelope. In the work reported here, the researchers produced antisera for five of them: p12, p19, p20, p42, and p61. Cell-free translation and all the stages of analyzing its products were performed in the presence of protease inhibitors. Proteins p12, p20, and p42 appear as a result of post-translation modification of the products of one virus gene. Protein p20 is formed by the oligomerization of two protein p12 molecules, while p42 is formed by the oligomerization of four p12 molecules. Monospecific antisera to the main structural proteins of the intracellular vaccinia virus envelope were produced and analyzed by radioimmunoblotting. The dynamics of the accumulation of the respective proteins in the infected cells were studied. The antisera to proteins p19 and p61 do not bind with any of the labeled polypeptides. Figures 5, references 20: 3 Russian, 17 Western.

UDC 578.891:578.74].08

Polymerization of DNA Fragments That Code for Epitopes of Hepatitis B Virus Surface Antigen in Escherichia coli

907C0429B Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 10, Oct 89 (manuscript received 23 Jan 89) pp 24-29

[Article by O. V. Sergiyenko, V. G. Lunin, T. I. Tikhonenko, All-Union Scientific Research Institute of Agricultural Bioengineering, All-Union Academy of Agricultural Sciences imeni V.I. Lenin, Moscow]

[Abstract] Amplification of genes or their fragments makes it possible to produce proteins with repeating sections—that is, to imitate the polyantigenic structures of the virus capsid—and it is one of the ways of overcoming the low immunogenicity of subunit vaccines produced by genetic engineering. The objective of the work reported here was th polymerization of synthetic polynucleotide duplexes that code for the epitopes of hepatitis B virus surface antigen (HBsAg), plus the study of the stability of direct repeaters of DNA and the determination of the optimal degree of polymerization necessary for the maximum expression of the chimera protein. Polymers $(AC)_8$ and $(BCAC)_8$ were produced as a hybrid with chloramphenicol acetyltransferase and B-galactosidase under the control of a chloramphenicol promoter. Repeating DNA fragments were included in the cro-lacZ hybrid gene to enhance expression of the chimera proteins containing the polymerized HBsAg epitopes. The stability of recombinant molecules with the repeating DNA fragments was studied in relation to the purpose of the experiment and individual properties

of the repeating fragments. DNA stability during transformation was studied on plasmids coding for derivatives of cro-lacZ hybrids. Stability in growth and transformation depends on the number of repeaters. A factor that diminishes DNA stability is rise in temperature to 42°C. The researchers conclude that conditions for transformation, growth, expression, genetic environment of the recipient cell, number of repeating fragments and individual properties of the repeating monomers affect DNA stability. There exists an optimum degree of polymerization that is determined by the individual properties of the repeating sequences. It was shown that the proteins cro$(AC)_4$lacZ and cro$(BCAC)_2$lacZ—which have a high level of expression and plasmid DNA that is stable during growth and transformation and code for these proteins—are optimal for the HBsAg A, B, and C epitopes. Figures 5, references 21: 6 Russian, 15 Western.

UDC 577.1

Electron-Microscopic Study of Root Meristem of Corn Sprouts Obtained in Experiments on Genetic Transformation

907C0492A Kiev TSITOLOGIYA I GENETIKA in Russian Vol 23 No 6, Nov-Dec 89 pp 3-6

[Article by K. M. Bilich and Ye. A. Larchenko; Institute of Molecular Biology and Genetics, UkSSR Academy of Sciences, Institute of Physiology of Plants and Genetics, UkSSR Academy of Sciences, Kiev]

[Abstract] A study of the ultrastructure of cells of the root meristem of shoots of corn C-72 revealed unusual behavior on the 2d day of germination. Cells in which the nucleus had an improper, highly contorted nucleus as well as typical meristematic cells appeared. Chromatin fragments appeared in the cytoplasm with these nuclei and in their immediate vicinity. Electronograms revealed a "transition" of chromatin substance from the nucleoplasm into the cytoplasm. Nucleoli, extruding into the cytoplasm, had a typical structure. Different kinds of nuclear migration appeared. Dumb-bell shaped nuclei, the narrow part of which intersected the cell membrane, appeared. The anomalies appeared in 4 of 5 grains of line C-72. The anomalies appeared in certain zones only. The connection between the pictures of extrusion with the described restitution nuclei and the cytomixes process could not be clearly interpreted. Figures 4; references 17: 5 Russian; 12 Western.

UDC 577.21

Use of Multicopy Plasmid pUC19 to Ensure Constitutive Expression of Eschericia coli rp1L Gene

907C0492B Kiev TSITOLOGIYA I GENETIKA in Russian Vol 23 No 6, Nov-Dec 89 pp 22-24

[Article by S. B. Zolotukhin, A. N. Zhibolup, I. V. Krupskaya et al.; Institute of Molecular Biology and Genetics, UkSSR Academy of Sciences, Kiev]

[Abstract] A study of the possibility of constructing a multicopy plasmid which ensures constitutive synthesis of protein L7/L12, coding for gene rp1L revealed a mutation in the lac-operator region of pUC19 plasmid, producing an increase in β-galactoside activity. The plasmid was used as a vector to ensure increased expression of the E. coli rpiL gene, cloned in it. Figure 1; references 12: 2 Russian; 10 Western.

UDC 616.75-018.2-073.75

X-Ray Study of Structural Changes in Collagenous Fibers of Tendons in White Rats Exposed to Chronic Effect of Constant Magnetic Field

907C0466A Yerevan ZHURNAL EKSPERIMENTALNOY I KLINICHESKOY MEDITSINY in Russian Vol 29 No 4, Jul-Aug 89 (manuscript received 22 Mar 88) pp 376-380

[Article by G. A. Tonoyan and Yu. A. Rapyan, Department of Medical and Biological Physics, Yerevan Medical Institute]

[Abstract] X-rays were used to study the structural changes in the collagenous fibers of tendons in white rats subjected to whole-body exposure to a 0.5 T constant magnetic field. The X-rays show that, after the exposure is halted, the disorientation of the crystallites diminishes on a schedule that is a function of the number of days of exposure. Figures 2, references 6 (Russian).

UDC 616-036.82:616—001+616.714:615.814.1

Use of Decimeter-Wave Therapy and Acupuncture in Combined Treatment of Patients with Head Injury Sequelae

907c0407 Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 8, Aug 89, pp 6-19

[Article by M. A. Lysenko (deceased), G. Kh. Polatova, A. M. Berdyklychev, T. A. Aleksandrova, L. I. Svadovskaya, and E. V. Grigoryants, Turkmen Scientific Research Institute of Neurology and Physiotherapy]

[Abstract] Functional disorders that limit an individual's ability to work often remain for long periods after a head injury. The purpose of the work reported here was to study the effectiveness of combined therapy consisting of exposure to decimeter electromagnetic waves and acupuncture in 120 individuals with vegetative-vascular syndrome as a result of an open head injury. The age range for the group was 16-50. In addition to undergoing the usual clinical-neurological observations, each individual, before and after treatment, underwent rheoencephalography, echo encephaloscopy, electroencephalography, ophthalmoscopy, and X-ray. Most of the patient complaints consisted of headaches, vertigo, malaise, fatigueability, nightmares, and poor memory. Neurological status included convergence insufficiency, nystagmoid twitching of the eyeballs, Romberg's sign, uniform animation of periosteal and articular reflexes, static tremor of eyelids and the fingers of outstretched hands, acrocyanosis, hyperhidrosis of the palms and feet, and labile pulse. The individuals were placed into three groups, each group with equivalent clinical symptoms and each group undergoing different combinations of treatment. Group I (40 individuals) received a combination of decimeter-wave therapy and acupuncture (10 procedures per day, with a two-hour break). Group II (40 individuals) received a course of decimeter-wave therapy, and then a course of acupuncture, for 10 days. Group III (the control) received acupuncture only (10 days). All treatments were performed against a backdrop of symptomatic therapy, massage, and therapeutic exercise. The decimeter therapy was performed in the collar area with a 20-W Volna-2 unit, for 10-12 minutes a day. The criteria for what was called "considerable improvement" consisted of disappearance of headaches, reduction of emotional lability, normalization of sleep, and positive shifts in REG, EES, and EEG. The criterion for "improvement" consisted of fewer pathological manifestations in clinical and paraclinical examination. "No improvement" was the third category. The greatest therapeutic effect was experienced by group I (80 percent were "improved," 6.6 percent "considerably improved"). References: 9 (Russian).

UDC 615.214.31:547.96].015.4:612.821.1].3].076.9

Effects of Nootropic Tuftsin Peptide and Piracetam on Avoidance Reaction in Normal and Conflict Situations

907C0840C Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 109 No 5, May 90 (manuscript received 3 May 89) pp 445-446

[Article by A. N. Inozemtsev, F. F. Kokayeva, I. I. Kozlovskiy, Ye. I. Sarychev, V. M. Demidov and N. A. Tushmalova, Chair of Higher Nervous Activity, Moscow State University; Institute of Pharmacology, USSR Academy of Medical Sciences, Moscow]

[Abstract] Since tuftsin has been shown to enhance learning in experimental animals, an analysis was conducted on the actiity of the most active tuftsin-group synthetic peptide—TP-1—on the avoidance reflex. Trials with 180-220 g outbred albino male rats showed that i.p. administration of 300 μg of TP-1 or of 500 mg/kg piracetam enhanced significantly acquisition of the conditioned response in a system employing sound as the conditioned stimulus and electric shock as the unconditioned stimulus. However, with TP-1 a significant increase in correct responses was achieved on the 2nd day and a maximum on the 3rd day, whereas with piracetam a significant increase was obtained on the 1st day (with subsequent performance on par with control animals.) In conflict situations TP-1 ensured retention of the conditioned avoidance reflex to a much greater extent than piracetam. Consequently, the data showed that TP-1 serves as a more efficient nootropic agent than piracetam. Figures 1; tables 1; references 9: 6 Russian, 3 Western.

UDC 615.273.55.201.4.6:6.15.451.234-08:616.005.6-08

Use of Liposomes to Administer Terrilithin

907c0375 Kazan KAZANSKIY MEDITSINSKIY ZHURNAL in Russian Vol 70 No 5, Sep-Oct 89 (Manuscript received 01 Feb 89) pp 329-331

[Article by T. N. Kovaleva, G. D. Kobrinskiy, Scientific Research Institute of Human Morphology, USSR Academy of Medical Sciences]

[Abstract] In their search for a carrier that would protect drugs from degradation by intestinal tract enzymes, the researchers struck upon liposomes, which are phospholipid bubbles that can enclose other substances. Liposomes represented an excellent carrier for a number of reasons. They are similar in composition to natural cell membranes, which makes them well-tolerated by the body. As a polysynthetic, they can be altered extensively (surface features, composition, size, etc.). While protecting their contents, they also protect healthy cells and tissue from the toxic effects of drugs used for treatment of, for example, cancer or leishmaniasis. Liposomes also enable targeted-administration, and they are capable of penetrating the surface of cell membranes to the cytoplasm, where they deliver their contents. The researchers here studied the possibility of producing a thrombolytic effect with liposomal delivery of a proteolytic enzyme, terrilithin. The liposome was prepared from lecithin (phosphatidylcholine) and cholesterol in a molar ratio of 7:3. When the liposomal form of terrilithin was administered to rabbits with experimental thrombi, the researchers noted complete lysis of the thrombi in 43.7 percent of the rabbits, wall-attached thrombi at various stages of lysis in 37.5 percent, and no effect in 18.7 percent. In a control group, the thrombi remained in 75 percent of the rabbits, and they underwent spontaneous lysis in 25 percent. Hemostasis studies indicated that the liposomally enclosed terrilithin reduced coagulation within an hour. References 9: 4 Russian, 5 Western.

UDC 577.1714:327.2

Tripeptide pGluAsnGly Testing on Models of Aggressive Behavior in Rats and Mice

907C0434C Yerevan NEYROKHIMIYA in Russian Vol 8 No 2, Apr-Jun 89 (manuscript received 27 Nov 88) pp 273-277

[Article by A. L. Rylov and Yu. N. Utkin, Institute of Normal Physiology imeni P. K. Anokhin, USSR Academy of Medical Sciences; Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR Academy of Sciences, Moscow]

[Abstract] In light of a report by Reichelt *et al.* on the aggressive effect of the tripeptide pGluAsnGly, the researchers investigated the aggressiveness induced by the tripeptide on three models of aggression in rats and mice: isolated male aggression, predatory aggression, and shock-induced aggression. Their findings show that injection of the tripeptide had no reliable effect on aggression in any of the models; nor did it have any side effects or toxic effects. The researchers failed to reproduce Reichelt's results. Typically, they found, the tripeptide had no effect on behavior at all. Figures 1; references 2 (Western).

UDC 617.736-007.17-085

Taufon and Emoxypine in Comprehensive Treatment of Sclerotic Maculodystrophies

907C0482B Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 8, 1989 (manuscript received 12 Jul 89) pp 463-465

[Article by N. I. Shpak, N. I. Naritsyna, and N. V. Konovalova, Odessa Order of the Red Banner of Labor Scientific Research Institute of Eye Diseases and Tissue Therapy imeni Academician V. P. Filatov]

[Abstract] Taufon and emoxypine are new preparations suggested for improving the condition of eye tissues.

Emoxypine (2-ethyl-6-methyl-4-oxypyridine chlorhydrate) was developed by the Clinical Physics Institute of the USSR Academy of Sciences and the All-Union Chemical Physics Scientific Research Institute imeni S. Ordzhonikidze. Emoxypine is a retina-protector which helps resorb inner eye hemorrhage, decreases the permeability of the capillaries, and decreases the coagulation of the blood. Taufon was synthesized by the All-Union Scientific Research Institute of Medical Technology of the USSR Ministry of Health, the Moscow Scientific Research Institute of Eye Diseases imeni Gelmogolts, and the Scientific Research Institute of Biophysics of the USSR Academy of Sciences. Taufon stimulates the regenerating and reparative processes in dystrophic diseases and afflictions accompanied by disturbances of eye tissue metabolism. It helps normalize the functions of the cell membrane. Thirty-seven of 57 patients with the early "dry" form of sclerotic maculodystrophy were given taufon injections every other day, with 15-20 injections per course of treatment. Vision began to improve 7-8 days after beginning treatment. Twenty-three of 48 patients in a second group received emoxypine injections, with 10-15 injections per course of treatment. After 4-5 injections a decrease in the density of edema in the macula region was noted, and by the end of treatment, the hemorrhaging had almost completely been resorbed and edema in the retina was greatly reduced. Long-term results of treatment showed that stabilization of visual functions was achieved in 76 percent of patients. References 6 (Russian).

UDC 613.632-099.616.155.3

Forensic-Medical Significance of Functional and Morphological Changes of Leukocytes in Diagnosis of Acute Poisoning With Certain Pesticides

907C0460D Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 11, Nov 89 (manuscript received 23 Nov 88) pp 58-60

[Article by A. N. Iskandarov, A. R. Sirota, and M. I. Iskandarov, Central Asian Medical Pediatric Institute]

[Abstract] Forensic-medical diagnosis in pesticide poisoning is difficult because of the absence of specific morphological signs and the limitations inherent in forensic-medical testing that stem from the small doses of the toxic chemicals and the life-saving detoxification that is performed. Additional diagnostic criteria are therefore needed. Quantitative, morphological, and functional changes were studied in leukocytes in Wistar rats following acute poisoning with the pesticides decis, isophene, or phosalone. The animals received one dose intragastrically in an oil solution or emulsion in doses of ½ LD_{50} of the toxic chemicals. After 4-5 days, the total number of leukocytes, the percentage and total content of the individual types of leukocytes, and the nature and frequency of qualitative changes were studied. The functional condition of the leukocytes was assessed by studying their metabolic status. The activity of several enzymes participating in oxidation-reduction and catabolic reactions was studied using indices of intracellular metabolism. A sharp increase in the total number of leukocytes, especially segmented nuclei neutrophils, was noted following acute poisoning with pesticides. Lymphocytopenia and eosinopenia were noted in all groups. A decrease in the relative and total content of lymphocytes was observed. Toxic graininess of the neutrophil cytoplasm, pyknosis, swelling, and other disorders of neutrophil nuclei were also noted. References 7 (Russian).

UDC 613.6:359].616.36-002.12/.14

Clinical and Psychophysiological Evaluation of Effect of Pyrroxane on Restoration of Fitness Among Seamen Who Have Had Viral Hepatitis A

907C0443B Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 11, Nov 89 pp 55-56

[Article by Lt Col Med Serv Yu. V. Lobzin (candidate of medical sciences), Col Med Serv V. B. Gnoyevoy (candidate of medical sciences), Maj Med Serv Yu. N. Mosichev, and Maj Med Serv A. A. Galemshin]

[Abstract] The effect of the psychomodulator pyrroxane in restoring the fitness of navy operator specialists who had had viral hepatitis A was studied. Two groups of seamen aged 18-20 years recovering from viral hepatitis A were studied in identical conditions in a rehabilitation ward. The first group received pyrroxane twice a day for 30 days, while the other was given a placebo. In the first group, fatigue during morning exercises and work therapy subsided and sleep normalized. Sensorimotor reactions were measured to study the process of excitation and internal inhibition and mobility of the basic nerve processes in the central nervous system. Relative sensorimotor disorder in those with viral hepatitis A has been demonstrated, but in the first group the ability for fine sensorimotor coordination was much higher by the twentieth day of the rehabilitation period. It was demonstrated that pyrroxane has a very positive effect on the memory, attention, and sensorimotor functions in people with viral hepatitis A. References 5 (Russian).

UDC 612.813+612.822.3+612.398

Comparative Description of Membrane Mechanisms of Effect of Phenamine and Its Derivatives on Ion Channels of Isolated Mollusc Neurons

907C0433A Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian Vol 75 No 8, Aug 89 (manuscript received 20 May 88) pp 1069-1074

[Article by A. I. Vislobokov, V. V. Mantsev, V. V. Marenichev, M. A. Dumpis, N. I. Kudryashova, Yu. V.

Zaytsev, Laboratory of Structural and Functional Adaptations, Physiology Scientific Research Institute imeni A. A. Ukhtomskiy State University; Department of Pharmacology of the Scientific Research Institute of Experimental Medicine of the USSR Academy of Sciences, Leningrad]

[Abstract] The psychotropic preparation phenamine (amphetamine) has a multifaceted effect on the body. In order to find new drugs based on phenamine, its heavy derivatives were synthesized. The effect of some of them on memory and learning has been studied in animals, but there is no data on the membrane effects of phenamine or its derivatives. The effect of phenamine and two of its derivatives, IEM 1365 and IEM 1370, on the electrically controlled ion channels of pond snail neurons was studied, and the selectivity of action on sodium, calcium, fast potassium, and slow potassium channels was assessed. Some membrane mechanisms of action were explained. The experiments were conducted on isolated *Lymnaea stagnalis* neurons in conditions of intracellular dialysis and fixation of the membrane potential. Phenamine causes a biphasic change for all currents—an increase in the currents at low concentrations, and a decrease at high concentrations. IEM 1365 had a monophasic, nonselective effect on the ionic currents, while IEM 1370 had a monophasic, selective effect. In some experiments, phenamine and IEM 1365 were placed on the inside of a neuron membrane, with about the same effects as when they were placed on the outside. Phenamine and its derivatives have a membranotropic and membrane-stabilizing effect on the mollusc neurons. The changes in the ionic currents observed are due to a change in the distribution of channels by their conditions (closed, inactivated); a change in the operating mode of isolated channels; and the effect of compounds on the phosphorylation-dephosphorylation process of protein subunits in the channels. Figures 3, references 7: 6 Russian, 1 Western.

UDC 612.814+577.4

Role of Catecholaminergic Synapses in Mechanism of Formation of Adaptations, With Participation of Polyphenol Adaptogens

907C0433B Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian Vol 75 No 8, Aug 89 (manuscript received 10 Feb 88) pp 1082-1088

[Article by A. V. Lupandin, Department of Sports Medicine, State Institute of Physical Education, Khabarovsk]

[Abstract] In experiments on albino mice and rats, the researchers evaluated the interaction of polyphenol adaptogens, on the one hand, and catecholaminergic synapse agonists and antagonists, as well as inhibitors of synthesis enzymes and catecholamine transformations, on the other. The resistance of the animals to extreme physical exertion and hexenal were assessed. Several polyphenol adaptogens were tested and were shown to prolong stereotypy in the animals. The adaptogens increase the animals' resistance to fatigue and the depressing effect of hexenal. The agonists of the catecholaminergic structures and inhibitors of catecholamines and dopamine were synergistic with the adaptogens. The adaptogens do not affect pooling of the catecholamines, nor do they react with dihydroxyphenylalanine decarboxylase or dopamine-B-hydroxylase. Their effects depend on the amount and duration of the catecholamines in the synapse. The main point of the effect of polyphenol adaptogens on the catecholaminergic synapse is with the component of the transport-enzymatic system for inactivating catecholamines. One of the components of the mechanism for increasing resistance to extreme conditions caused by polyphenol adaptogens is correction by the latter of the functions of the catecholaminergic synapses by inhibiting the component of the transport-enzymatic system for inactivating catecholamines. References 20: 10 Russian, 10 Western.

UDC 612:615:577

What Kind of Structure Do the Recognition Centers of Receptors of Regulatory Amino Acid Substances Have?

907C0384A Moscow USPEKHI SOVREMENNOY BIOLOGII in Russian Vol 108 No 2, Sep-Oct 89 pp 217-234

[Article by I. N. Pidevich]

[Abstract] The amino acids that are part of the recognition (binding) centers of the receptors of histamine, serotonin, catecholamines, acetylcholine, glycine, gamma-aminobutyric acid, and some other ligands were determined. New techniques of decoding the structure of receptor recognition centers were developed to overcome the inadequacies of traditional techniques. The structure and physico-chemical and quantum chemical properties of the ligands of various receptors and side chains of 20 standard amino acids that make up proteins, plus the pharmacological characteristics of receptors, their modification, their primary and secondary structure, and the energy of interaction with ligands were compared. The researchers hypothesize that histidyl is part of the histamine receptor recognition center, that tryptophanyl is part of the serotonin receptor recognition center, that tyrosyl or phenylalanyl are part of the catecholamine receptor recognition centers, and that threonyl is part the choline receptor recognition centers. Glutaminyl is thought to help bind complementary fragments of adenosine. It is assumed that the R-groups of regulator peptides and protein-peptide hormones in a non-ionized state non-covalently react with analogs or similar R-groups of recognition centers, while fully ionized R-groups of ligands react with the oppositely charged R-groups of the receptors at physiological pH values. References 99: 32 Russian, 67 Western.

UDC 591.555:612.821.8

Biological and Ethological-Pharmacological Aspects of Aggression, Fear, and Anxiety

907C0384B Moscow USPEKHI SOVREMENNOY BIOLOGII in Russian Vol 108 No 2, Sep-Oct 89 pp 289-298

[Article by V. P. Poshivalov, First Leningrad Medical Institute imeni I. P. Pavlov]

[Abstract] Current data on the development of ethological models of aggression, fear, and anxiety in animals and the more promising means of pharmacological regulation of these forms of behavior are summarized and analyzed. Experimental conditions were designed to be as much like those in nature as possible. The basic types of aggressive behavior classified included aggression provoked by external and internal stimuli. Each model reflects various mechanisms of aggression. Alterations in the chemical balance also affect aggressive behavior. Means of pharmacological suppression of aggressive behavior by using GABA, benzodiazepines, barbiturates, and ethanol are discussed. The problem of regulating aggressive behavior should not be regarded as simple suppression of aggression only. A system of adequate experimental models of aggressive behavior needs to be developed which would make describing the entire structure of behavior possible by using computers. Pharmacological activation and restoration of aggressive behavior were studied on rodents and primates. Antidepressants were used to restore aggressive behavior that had been suppressed by unfavorable factors. Behavioral models of fear and anxiety were explained. Benzodiazepine derivatives were used to regulate fear and anxiety conditions. Small doses of benzodiazepines are able to protect animals from various stresses. This interdisciplinary approach to developing new behavior models and a more thorough understanding of the connection between neurochemical processes and behavior is a productive one. A substance that is very anti-aggressive or aggressive or that selectively affects conditions of fear and anxiety has not yet been isolated. References 65: 31 Russian, 34 Western.

UDC 615.285.7:577.175.22].036.8:576.895.775

Effect of Synthetic Juvenile Hormone Analog on Xenopsylla Skrjabini Fleas

907C0415C Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 5, Sep-Oct 89 (manuscript received 29 Jun 88) pp 85-87

[Article by L. S. Yershova, O. S. Serzhanov, A. P. Kogerman, S. I. Zolotova, A. F. Tkachenko, Central Asia Scientific Research Anti-Plague Institute, Alma-Ata]

[Abstract] The researchers studied the effect of juvenile hormone analog, efoxen-II, on *Xenopsylla skrjabini* fleas, the main plague carriers. Efoxen-II was synthesized at the Institute of Chemistry, Estonian SSR Academy of Sciences (Tallinn). The preparation was mixed with sand and bovine blood in a flask, and then the fleas were added. Efoxen-II was found to affect the development of the insects during metamorphosis. A dose of 25 x 10^{-3} ml/g is very effective and may be tested in field conditions. References 6: 5 Russian, 1 Western.

UDC 612.46+612.13+615.25

Orthostatic Stability of Dehydrated Healthy Men

907C0644A Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 1, Jan-Feb 90 (manuscript received 5 Jul 88) pp 112-117

[Article by V. B. Noskov, A. N. Kotov, M. Yu. Volkov, O. N. Rustamyan, Yu. V. Sukhanov and K. S. Yurova, Moscow]

[Abstract] An analysis was conducted on the impact of dehydration induced by 80 mg of furosemide on orthostatic stability and reactivity of cardiopulmonary and endocrine systems. The standard 20 min orthostatic test was performed on ten men (25-42 years old, 78 kg average weight, 177 cm average height). Hemodynamic monitoring, blood chemistries and urinalysis demonstrated that the response of the cardiopulmonary system was dependent on the degree of hypovolemia as well as individual neuroendocrine reactivity. The results demonstrated that a 7 to 20 percent hypovolemia was tolerable without onset of orthostatic instability due to adequate mobilization of neuroendocrine reserves. The response of the renin-angiotensin-aldosterone axis with that degree of hypovolemia ensured sufficient vacular tone to preclude postular instability. Tables 4; references 10: 5 Russian, 5 Western.

UDC 612.28+612.825.4

Physiological Sequelae of Voluntary Breath Holding

907C0644B Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 1, Jan-Feb 90 (manuscript received 15 Jun 88) pp 118-126

[Article by V. B. Malkin and Ye. P. Gora, Moscow]

[Abstract] In view of the importance of breath holding tests in assessing occupational suitability of cosmonauts, pilots and underwater divers, an analysis was conducted on individual responsiveness of the cardiopulmonary system, oxygen saturation of the blood, and the CNS to voluntary inspirational and expirational breath holding. The experimental cohort consisted of 100 males and females 17 to 21 years old, including ten pairs of monozygotic and dizygotic twins. Phase studies demonstrated that individual variability in the time required for incoordination of the respiratory musculature (Phase 1) was insignificant. However, variability was pronounced in Phase 2 (time to resumption of normal respiration.) The Phase 1 data indicate that there are no sex differences in the sensitivity of the respiratory center to humoral and neurogenic factors. The considerable individual variability that was observed in Phase 2 data demonstrated the importance of age, sex, and inheritance. In addition, disappearnce of α-waves on EEG in some individuals in Phase 2, i.e., during maximum voluntary effort, indicates that EEG monitoring may be used as an indicator of individual capability for volitional stimuli. Tables 3; references 26: 19 Russian, 7 Western.

UDC 612+2:612.23.234

Acid-Base Balance in Men Breathing Air with Raised CO_2

907C0644C Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 1, Jan-Feb 90 (manuscript received 5 Jul 89) pp 127-132

[Article by I. A. Sapov, V. I. Kuleshov, I. V. Levshin and Yu. Yu. Keyerig, Military Medical Academy imeni S. M. Kirov]

[Abstract] The effects of different levels of CO_2 in inspired air on acid-base balance were studies in 34 men, 2-35 years old, subjected to 3.5, 4.5 or 5.5 percent CO_2 for 72, 42, or 22 h, respectively. Oxygen was maintained at 17.0 to 18.0 percent. Hypercapnia was most pronounced in the 5.5 percent CO_2 group, with the arterial pH falling to 7.322 and venous pH to 7.252, and the corresponding pCO_2 values raising to 6.70 and 8.41 kPa, respectively. Accordingly, this group was felt to be most at risk of hemic hypoxia and metabolic acidosis, indicating that exposure to 5.5 percent CO_2 for 22 h represents a critical situation in closed systems, such as prevail in space ships. Tables 3; references 20: 18 Russian, 2 Western.

UDC 612.273.2

Effects of Work and Raised CO_2 Combination on Respiration and Thermoregulation

907C0644D Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 1, Jan-Feb 90 (manuscript received 2 Jul 87x) pp 133-140

[Article by S. V. Levinskiy and I. I. Malkiman, Moscow]

[Abstract] An assessment was conducted on the effects of physical exeretion (57 W for 20 min) and raised ambient CO_2 (5-6 percent) on respiration and thermoregulation, a problem gaining in importance with expansion of space exploration. The study encompassed 8 men, 25-35 years old subjected to 5-6 percent CO_2 for 4 h/day for 3 days with and without physical work. Quantitative information was derived from pulmonary function studies and measurement of rectal temperature. The results led to classification of the subjects into three types. Type 1 individuals exhibited considerable tolerance of oxygen debt and maintained or actually increased body temperature on exertion. Type 2 subjects were characterized by inadequate adaptation to elevated CO_2 and an inability to maintain body temperature at a normal level. Finally, Type 3 subjects showed the greatest fall in body temperature ($< 36°C$) and a minute volume below 40-50 liters/min with $F_E = 0.4$ vol percent and, obviously, were

least tolerant of raised CO_2. Figures 4; tables 2; references 8: 7 Russian, 1 Western.

UDC 616.853-085.2/3

Correlation Between Plasma Kynurenine Levels and Anxiety in Healthy Men

907C0644E Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 1, Jan-Feb 90 (manuscript received 5 Jul 88) pp 160-161

[Article by A. B. Orlikov, A. V. Rubitel and I. V. Ryzhov, Leningrad Scientific Research Psychoneurological Institute imeni V. M. Bekhtereva]

[Abstract] Plasma levels of kynurenine were correlated with personality assessment (Spielberg (sp?)-Khanin scale) in order to determine whether a correlation prevails between kynurenine and predisposition to anxiety. The results showed that a plasma concentration of kynurenine of 93.4 μg percent showed a positive correlation of r = 0.848 with reactive anxiety. This observations suggests that kynurenine may have a role as an endogenoys anxiogenic role. References 7: 6 Russian, 1 Western.

UDC 615.361.81:547.96].015.4.612.178.1].2].076.9

Modulation of Cardiotropic Action of Neurotransmitters by DSIP

907C0840A Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 109 No 5, May 90 (manuscript received 26 May 89) pp 419-420

[Article by L. S. Ulyanskiy, M. A. Zvyagintseva and I. L. Kosharskaya, Laboratory of Experimental Cardiology, Scientific Research Institute of Normal Physiology imeni P. K. Anokhin, USSR Academy of Medical Sciences, Moscow]

[Abstract] The fact that DSIP (delta sleep-inducing peptide) enhances cardiovascular stability in stress led to an assessment of its potential in modulating the effects of acetylcholine and norepinephrine on the isolated heart. The perfusion studies were performed with hearts derived from chinchilla rabbits, employing perfusion with Tyrode's solution containing either 6 x 10^{-6} M DSIP, 10^{-6} M acetylcholine, or 10^{-6} M norepinephrine or the approproate combination. The results demonstrated that DSIP potentiates the negative chronotropic effect of acetylcholine and attenuates the positive effect of norepinephrine. Accordingly, these findings suggest that DSIP affects heart function by modulating acetylcholine-norepinephrine interplay. figures 2; references 10: 8 Russian, 2 Western.

UDC 616.714+616.831]-001-092.9-085.357:577.175.829]-036.8

Protective Action of TRH and Synthetic TRH Analog PR-546 in Craniocerebral Trauma

907C0840B Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 109 No 5, May 90 (manuscript received 8 Jun 89) pp 432-434

[Article by I. Ye. Gurskaya, O. A. Pleukhova, N. A. Belyakov, S. A. Kuzmichev, G. L. Servatinskiy and P. Ya. Romanovskiy, Chair of Human and Animal Physiology, Biological Faculty, Moscow State University; Department of Experimental Pulmonology, State Institute of Postgraduate Medicine, Leningrad]

[Abstract] In view the fact that TRH (thyrotropin releasing hormone) has been shown to influence respiration and circulation, its effects on pulmonary edema and blood gases was investigated in experimental craniocerebral trauma. The studies were conducted on 180-220 g albino male rats subjected to impact trauma on the head. Experimental animals were pretreated before the trauma with either TRH (0.5-1 mg/kg; i.p.) or PR-546 (synthetic TRH analog; 4-8 mg/kg; i.p). The results showed that 80 percent of the deaths of control animals occurred within 3-5 min, with pulmonary edema, acidosis, hypoxemia, hypercapnia, hemoconcentration, and convulsions. Pretreatment with TRH or PR-546 reduced mortality to 10-20 percent, a difference correlated with less pronounced hypoxemia and attenuated or transient changes in the other blood chemistry parameters, and absence of convulsions. Importantly, TRH and PR-546 treated animals did not develop pulmonary edema. The efficacy of TRH and PR-546 was attributed to their beneficial effects on the respiratory center and the heart. In this respect PR-546 is of particular interest since it is devoid of endocrine effects. Figures 2; tables 1. references 8: 5 Russian, 1 Western.

UDC 612.82.014.46:[615.356:577.175.852].06:613].086

Morphometric and Histochemical Analysis of Angiotensin-II Effects in Emotional Stress

907C0840E Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 109 No 5, May 90 (manuscript received 2 Feb 89) pp 494-497

[Article by A. G. Ishchenko, Laboratory of Neurohistology imeni B. I. Lavrentyev with Electron Microscopy Suite, Institute of Normal Physiology imeni P. K. Anokhin, USSR Academy of Medical Sciences, Moscow]

[Abstract] Morphometric and cytochemical studies were conducted on brain formations involved in the drinking reaction to assess the effects of immobilization and angiotensin-II. The experiments carried out on 250-300

g male Wistar rats with injection of 100 ng of angiotensin-II into a lateral ventricle. The results showed that the most pronounced changes affected the paraventricular nucleus of the hypothalamus. Immobilization alone enhanced function of the paraventricular nuclei, with the morphpmetric and cytochemical changes potentiated by the administration of angiotensin-II. Initially, nucleolar and cytoplasmic levels of nucleic acids showed a marked increase, while subsequent changes reflected functional exhaustion (central chromatolysis, hyperchromatosis and change of nuclear outline and ectopy.) The paraventricular nuclei were affected more serously than the supraventricular nuclei, reflecting the different degrees to which they are involved in the drinking response. Figures 1; tables 1; references 12: 3 Russian, 9 Western.

UDC 615.214.22.015.4.07

Harman Modulates Function of Brain Melatonin-Opioid System Participating in Mechanism of Development of Traumatic Shock

907C0434A Yerevan NEYROKHIMIYA in Russian Vol 8 No 2, Apr-Jun 89 (manuscript received 26 Feb 88) pp 191-196

[Article by R. A. Samsonenko, A. T. Dolzhenko, V. N. Yelskiy and A. V. Titiyevskiy, Central Scientific Research Laboratory of Donetsk Medical Institute, Donetsk]

[Abstract] Harman, β-carboline-3-carbonic acid ethyl ester, and other β-carbolines are known to competitively inhibit specific binding of radioactive benzodiazepines with membrane preparations and brain tissue homogenates. The researchers demonstrate the modulating effect of β-carbolines—harman and 3,4,-tetramethyleneharman (preparation C-383)—on the melatonin-opioid system in traumatic shock in experiments that subjected Wistar rats to 6 hr of compression of the soft tissue of the rear legs. Radioimmunoassay was used to measure melatonin levels in epiphyseal homogenates, cAMP and cGMP in homogenates of the hypothalamic region of the brain and adrenal glands, and opioid peptides in blood plasma. In control animals, the injection of harman and of C-383 boosted the release of Leu-enkephalin and β-endorphin into the blood; in experimental animals, however, the preparations produced a drop in blood levels of the opioid peptides. That suggests a modulating role for harman on the opioid system that stems from the close resemblance between harmans and the opiate receptors. Likewise, the β-carbolines elevated melatonin levels in control animals; the harmans lost some of that capacity in the experimental animals, but, nonetheless, resulted in elevated levels. Harman and C-383 consistently led to rises in both cAMP and cGMP. References 15: 7 Russian, 8 Western.

UDC 577.175.852

Relationship Between Enkephalin and Angiotensin Peptide Systems in Regulating Aggressive Behavior in Rats

907C0434B Yerevan NEYROKHIMIYA in Russian Vol 8 No 2, Apr-Jun 89 (manuscript received 10 Nov 88) pp 197-20

[Article by O. A. Gomazkov, A. P. Rostovtsev and A. D. Panfilov, Scientific Research Institute of Medical Enzymology, USSR Academy of Medical Sciences, Moscow]

[Abstract] In spite of the inadequacy of information on direct biochemical links between the angiotensin and enkephalin peptide systems, many factors point to their involvement in the regulation of the same physiologic phenomena. The researchers compare the effects of the enkephalin system on aggressive (muricidal) behavior in rats and the effects caused by angiotensin II. Four series of experiments were performed on preselected aggressive rats, their muricidal behavior judged on the basis of whether they had killed a mouse introduced into their cage and the time it took them to attack the mouse. The first series measured the activity of enkephalin-producing carboxypeptidase in the hypophysis, various brain segments, and in the adrenal glands. The second studied the effect of specific antibodies to Leu-enkephalin on the muricidal behavior. The third series examined the effects of simultaneous administration of Leu-enkephalin antibodies and angiotensin II. The fourth, which involved nonmuricial and slightly muricidal rats, identified a possible "triggering" role for [D-Ala^2,Leu^5]-enkephalin in the regulation of aggressive behavior. The researchers judged that enkephalin and angiotensin II perform the functionally opposite roles of aggression stimulator and aggression inhibitor, respectively. They hypothesize the existence of some third component that effects aggressive behavior as a special biological behavior; the enkephalin and angiotensin would regulate the third component's activity. Figures 2; references 10: 5 Russian, 5 Western.

UDC 612.843.215

Effect of Synthetic Analog of Leu-Enkephalin on Frog Electroretinogram

907C0368c Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 310, No 1, Jan 90 (manuscript received 11 Apr 89) pp 237-239

[Article by L. Vitanova, E. Popova, N. B. Kostelyanets, P. Kupenova, O. B. Ilinskiy, I. A. Shevelev, and S. Belcheva, Institute of Higher Nervous Activity and Neurophysiology, USSR Academy of Sciences, Moscow; Medico-Biological Institute, Medical Academy, Sofiya, Bulgaria]

[Abstract] The effect of the synthetic leu-enkephalin analog dalargin (tyr-D-ala-gly-phe-leu-arg) and the

antagonist naloxone on the electroretinogram (ERG) was studied in 45 isolated dissected frog eyes. The response to flashes of white light was measured during the 17-minute adaptation phase and for 40-45 minutes thereafter. Introduction of dalargin lowered the amplitude of both the *b*- and *d*-waves of the ERG within one minute, with the effect lasting for the entire experiment. Naloxone caused a tendency towards increased *b*- and *d*-wave amplitude after 10-15 minutes, with the *d*-wave giving a marked increase in 30 minutes. Administration of dalargin and naloxone together gave responses similar to those seen with naloxone alone, indicating full inhibition of dalargin by naloxone. The results suggest the presence of free receptors in the distal layers of the retina, of both the sigma and mu types. The results also confirm findings about the predominantly inhibitory effect of opioids on vertebrate CNS neurons. The response to naloxone demonstrates the presence and constant activity of an endogenous inhibitory opiate system in the retina. Figures 1; references 15: 2 Russian, 13 Western.

UDC 612.57+612.53

Correction of Thermal Condition of Human in Danger of Overheating

907C0433C Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian Vol 75 No 8, Aug 89 (manuscript received 5 Nov 88) pp 1162-1169

[Article by N. A. Slepchuk, V. I. Basakin, K. P. Ivanov, Laboratory of Heat Regulation and Bioenergetics, Institute of Physiology imeni I. P. Pavlov, USSR Academy of Sciences, Leningrad; Department of Theoretical Bases of Physical Education, Pedagogical Institute imeni P. I. Lebedev-Polyanskiy, Vladimir]

[Abstract] The effect that the removal of heat from the hands, lower legs, and feet has on the thermal condition (comfort) of the body when it is in danger of overheating are explained. Four healthy individuals aged 30-40 years were were kept in a chamber whose temperature remained at 20-22°C for 20-25 minutes. Skin temperatures of various parts of the body were recorded. The room temperature was then increased 0.62 +/- 0.02 degrees per minute to 38-39°C, with a relative humidity of 40-45 percent. After the subjects had been in the heat chamber for 50-60 minutes, heat removal from certain parts of the body was begun, and it lasted for 30 minutes. After the heat removal was turned off, the people remained in the heat chamber for another 30 minutes. Three series of studies were conducted, including heat removal from the (1) hands; (2) lower legs and feet; and (3) hands, lower legs, and feet. The temperature in the auditory canal, weighted mean skin temperature, and average body temperature were measured. In the heated chamber, blowing 18-24°C air over the hands improved the thermal condition of the people tested, as the hands are the most effective means the body has to eliminate heat. The lower legs and the feet also demonstrated good heat-elimination capabilities. Figures 2, references 12: 7 Russian, 5 Western.

UDC 612.591.+591.128

Effect of Aminazine on Functional State of Cardiovascular System During Hyperthermia

907C0463B Ashkhabad IZVESTIYAA AKADEMII NAUK TURKMENSKOY SSR: SERIYA BIOLOGICHESKIKH NAUK in Russian No 5, Sep-Oct 89 pp 59-65

[Article by V. A. Tashliyev, K. A. Amannepesov, A. O. Kafurov and A. N. Ulitin; Institute of Physiology and Experimental Pathology of the Arid Zone, Turkmen SSR Academy of Sciences]

[Abstract] Examination of effector manifestations of the cardiovascular system during hyperthermic stress and observation of their changes after the use of aminazine and a comparison and analysis of hemodynamic, thermometric and chronometric data included 2 series of experiments on unanesthesized 200-300 g rats. Both series (experimental and control) involved measurement of rheographic parameters, arterial pressure, rectal temperature and determination of length of survival after hyperthermia. Recording of these indicators for 60-70 minutes at 10-minute intervals at normal temperatures preceded a temperature increase to 45°C and subcutaneous injection of aminazine at a rate of 125 mg to 100 g of weight of the animal. Temperature was increased to 45°C and the parameters were measured after each degree of increase of rectal temperature thereafter until death of the animal from cardiac arrest. Analysis of changes in the blood circulation system permitted their subdivision into 3 periods: initial, compensation and decompensation. Block of the hypothalamo-hypophyseal system apparently slowed the blood pressure increase in the 1st 2 series. The yield of vasoactive substances proceeded slowly as shown by the gradual increase of the heart rate and the blood pressure. Their effectiveness peaked at 4°C and produced a pronounced increase in systolic pressure. Block of the hypothalamo-hypophyseal system reduced vascular resistance and promoted optimization of the systemic blood circulation, amplifying heat liberation processes and slowing the increase of rectal temperature. The decrease of vascular resistance reduced the general load on the heart and increased the period of work of the cardiovascular system under dosed heat loading. Optimal resistance of the vascular bed remained during increase of rectal temperature of 3°C (39.97 + or - 0.08). Further increase of rectal temperature reduced arterial pressure and cardiac output with subsequent reduction of these parameters. In this case, the hypothalamo-hypophyseal system was beyond control by aminazine and the vascular resistance increased and decompensation of the system ended. Figures 3; references 9 (Russian).

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Paid Medical Services for the USSR Population

907C0411 Moscow SOVETSKOYE ZDRAVOOKHRANENIYE in Russian No 10, Oct 89 pp 17-22

[Article by V. P. Korchagin, M. P. Roytman, N. P. Chelidze, V. V. Grishin and S. A. Sopin]

[Text] The urgency of developing the system of paid services in health care as a means of raising the volume and quality of health care rendered to the population was pointed out in the USSR Council of Ministers decree "On Measures for the Radical Restructuring of the Sphere of Paid Services for the Population" and in the "Basic Guidelines for the Development of Public Health Protection and the Restructuring of Health Care in the USSR in the 12th Five-Year Plan and in the Period Up to the Year 2000."

It should be noted, however, that the network of cost-accounting treatment facilities providing paid medical services to the public has not been adequately developed in the 60 years of its existence. In the structure of paid services, health care accounts for just 0.6 percent (1986), which does not correspond to the population's needs for high-quality medical and health-improvement services.

The opinion that was held quite recently that it is inadvisable to expand the volume of paid medical services can be explained, to a large extent, by the historically evolved role and place of cost-accounting treatment facilities in the health care system.

It was assumed that the creation of cost-accounting treatment facilities would be a temporary measure and that the phenomenon of paid medicine would later drop away as the network of budget-supported treatment-and-prevention facilities expanded and improved. That stereotype still exists to this day.

To large extent, what we have here is a focus on equalization of the distribution of benefits, which is associated with the practice of social demogaguery and with the portrayal of what is wanted as what actually exists. A realistic assessment of the situation as it now stands has led to change in the interpretation of the concepts of free and universally accessible health care.

It should be emphasized that the principles of free and universally accessible care were interpreted as absolute criteria possessing no limits or any real relationships to specific economic conditions. Today, we are compelled to raise the question of developing economically sound social norms and standards, including the so-called "socially guaranteed" norms of medical service. At present, in light of the change in our attitude toward the possibility of expanding paid health care for the public, we need to determine what volume of free health care services the society is in a position to guarantee with the existing level of development of productive forces; that must be done after we have first determined the volume of financial and material resources needed to ensure such a minimum. At the same time, we should also determine the volume of care which the population is prepared to acquire from the state with personal savings. In that connection, we need to determine the socially guaranteed—i.e., free—maximum level of consumption of health care services enabled by worldwide achievements in scientific-technical progress, by the objectives facing the state in public health protection at the present stage of development, and by the possible additional volume of medical services that can be acquired by the population.

We know that in any society, the most expensive modern methods of examination and treatment have always been, in one sense, "luxury items." Never will any economically highly developed society be able to provide all of its members with an unlimited volume of free medical and health improvement services. Nonetheless, if medicine is to improve, all of the most modern methods of diagnosis and treatment must be utilized along with the ordinary, widely accessible methods. Some forms of services will gradually move from limited availability to the ranks of socially guaranteed services, and they in turn will be replaced by new forms brought into being by scientific-technical progress.

However, that does not diminish the importance of improving the system itself of distributing health care services. We need to continue to strive for maximum implementation of the principles of social justice, so as to preclude conditions promoting the spread of the flawed phenomena of "shadow medicine." One of the most effective means in that regard is to arrive at an optimum combination of paid health care and the activities of cost-accounting health care facilities (or subunits).

The USSR Council of Ministers decree "On Measures for the Radical Restructuring of the Sphere of Paid Services for the Population" stipulated that the volume of paid medical services must be quadrupled in 1995 over what it was in 1987.

The dynamics of the development of paid health care provided by cost-accounting treatment-and-prevention facilities (or subunits) of the USSR Ministry of Health in 1980-1987 are shown in Table 1.

Table 1. Activity Indicators of Cost-Accounting Institutions (or Subunits) Providing Paid Services to the Population (in the USSR Ministry of Health System)

Indicator	Unit of measurement	Levels of indicators by year			
		1980	1985	1986	1987
Number of outpatient visits to cost-accounting health care facilities (subunits), including house calls	million	9.9	13.6	14.7	15.5
Percentage of number of outpatient visits to treatment-and-prevention facilities		0.39	0.46	0.50	0.54
Number of visits to cost-accounting facilities (subunits) for stomatological care and dental prostheses	millions	2.3	2.8	3.0	3.05
Percentage of number of outpatient visits to cost-accounting health care facilities (subunits)		23.2	20.4	20.4	19.7
Number of house calls by cost-accounting health care facilities (subunits)	thousands	102.6	107.4	109.1	112.1
Percentage of number of outpatient visits to cost-accounting health care facilities (subunit) (including house calls)		1.04	0.79	0.74	0.72
Average number of outpatient visits to cost-accounting facilities (subunits) per resident		0.037	0.049	0.052	0.054
Volume of paid medical services rendered	million rubles	177.5	243.8	274.6	378.3
Volume of paid medical services rendered:					
per resident		0.67	0.88	0.98	1.34
per adult resident		0.88	1.17	1.31	1.80

In 1987, paid services accounted for only 0.054 visits per resident; this indicator varies widely by union republic, a phenomenon explained by the varying degrees of development of the network of facilities providing paid medical services to the public and by the differences in the structure of the paid services provided.

The volume of paid medical services rendered by individual union republic is shown (in rubles) in Table 2.

Table 2. Paid Medical Services Rendered to the Population (All Departments)

Region	Reported, in million rubles		Volume of services per adult, in rubles	
	1986	1987	1986	1987
RSFSR	140.2	195.9	1.25	1.74
UkSSR	63.1	99.7	1.58	2.49
BSSR	13.1	17.3	1.70	2.23
Uzbek SSR	10.0	15.7	0.89	1.35
Kazakh SSR	11.3	20.2	1.02	1.79
Georgian SSR	10.1	11.9	2.57	3.00
Azerbaijan SSR	3.5	4.3	0.76	0.91
Lithuanian SSR	5.2	9.7	1.86	3.44
Moldavian SSR	4.1	7.3	1.37	2.42
Latvian SSR	2.9	3.0	1.40	1.45
Kirghiz SSR	3.1	5.5	1.20	2.08
Tajik SSR	2.3	2.9	0.83	1.02
Armenian SSR	2.2	3.7	0.92	1.51
Turkmen SSR	1.1	3.3	0.55	1.61
Estonian SSR	2.4	3.5	1.98	2.89
Total for USSR	274.6	408.0	1.31	1.94

Differences in the level of paid services at the republic level are stem from the fact that dental prostheses services, which are the most expensive form of paid services, are developed to varying degrees in the union republics.

An analysis of the number of health care workers providing medical services indicates that in 1980-1987, the number of official positions in cost-accounting facilities (subunits) increased by 23.5 percent, reaching almost 120,000, of which 96 percent were filled. The dynamics of the growth in physician positions for the same period were 42.9 percent (17,500 in 1980 and 25,000 in 1987), of which 91 percent were filled.

Medical personnel and other personnel involved in providing paid medical services represented 1.5 percent of the total number of all staff positions in health care in 1980 and 1.63 percent in 1987. On the other hand, the staff physician positions in cost-accounting health care facilities (divisions) represented 1.76 percent of the total number of staff physician positions in all health care facilities in 1980, and that figure increased to 2.0 percent in 1987.

The volume of paid medical services rendered by cost-accounting facilities (subunits) of the USSR Ministry of

Health grew by almost 38 percent in monetary terms in 1987 as compared with 1986. Over that same period, the number of patient visits to cost-accounting facilities (subunits) grew by only 5.4 percent.

That is explained by the fact that with the introduction of new, expensive diagnostic and treatment methods at cost-accounting health care facilities (subunits), with the rise in the prices of medical preparations and materials, and with rise in wages among health care workers, the average cost of one visit increases—i.e., paid services actually become more expensive as the overhead and incomes of the financial end of such facilities increase.

Special emphasis should be laid on the fact that the rates of growth of the profit earned by cost-accounting facilities remain low. The main reason for such a situation is the continuing practice of profits being removed and placed into the budget, as well as the wage rate system currently in effect in cost-accounting health care facilities providing paid services to the public.

By the beginning of 1988, the total expenditures by the population for paid health care in cost-accounting facilities (subunits) of the USSR Ministry of Health had doubled in comparison with what they were 1980; per resident, it increased, on average, to 1.34 rubles from 0.67, and per adult, to 1.8 rubles from 0.88.

A 1987 study of the activities of Moscow's cost-accounting facilities shows that the volume of services rendered by them and the structure of those facilities in relation to different types of services are dictated mainly by the limited capacities to satisfy public demand. Most of Moscow's cost-accounting outpatient-polyclinic facilities have a weak material-technical base, they are located (8 out of 11 facilities) in leased, poorly adapted quarters in residential buildings, and their actual traffic capacity exceeds the planned capacity indicators by a factor of 2-5. That creates considerable difficulties in providing services to patients, and it results in an immense failure to meet the needs for paid medical services and a large number of refusals of service.

The staffing levels of cost-accounting outpatient-polyclinic facilities are somewhat higher than in budget-supported polyclinics of Moscow in general; however, even here there is a shortage of both physicians and mid-level medical personnel. In 1987, the physician staffing level was at 86.2 percent, and that of mid-level medical personnel was at88.8 percent.

Moscow's cost-accounting outpatient-polyclinic facilities are staffed by highly skilled personnel: 73 percent of physicians are candidates of medical sciences, and 16 percent are doctors of medical sciences. Candidates of medical sciences handle 69 percent of the consultation visits, and doctors of medical science handle 10 percent, which indicates that the health care rendered is on a high professional level.

Visits to cost-accounting outpatient-polyclinic facilities in Moscow are primarily for consultation with internists (16.4 percent), gynecologists (13.7 percent), surgeons (10 percent) and neuropathologists (7.8 percent). A relatively small number of other specialized medical offices confined to narrow specialties are in operation, although the demand for such services is not being satisfied.

An extremely important part of the work of cost-accounting consultation-diagnostic polyclinics consists of house calls, which, in Moscow, are done by only six such polyclinics. Fifty-nine percent of visits are made for disease diagnosis, 40 percent are made to provide therapeutic procedures (manipulations), and 1 percent are made for surgery. It should be emphasized that the demand for those forms of medical care is being 20-30 percent satisfied.

The growth in value in real terms of the fixed capital of cost-accounting outpatient-polyclinic facilities in Moscow was 66 percent in 1984-1987. The capital-labor ratio in real terms of fixed capital per physician and per nurse is, on average, 1,637 rubles. That figure is higher than the figure for budget-supported polyclinics.

An analysis of the structure of the financial overhead for maintaining cost-accounting outpatient-polyclinic facilities in Moscow showed that wages and extra wages account for about 70 percent of the outlays, acquisition of equipment and materials 5-6 percent, other expenses 22-25 percent; about 1 percent of monetary assets are deducted for the maintenance of the Administration of Cost-Accounting Treatment Facilities (ACTF) and a centralized bookkeeping office. An analysis of fulfillment of the income plan of cost-accounting outpatient-polyclinic facilities revealed that actual income exceeds planned income considerably (by 20.4 percent in 1987). However, all the profits were transferred to the state budget, which deprived the cost-accounting facilities of the possibility for expanding and modernizing the material-technical base. Since 1987, Moscow's ACTF has had the right to dispose of profits as it sees fit.

A study of individuals who sought care at cost-accounting consultation-diagnostic polyclinics showed that those who used paid services belong to various social groups. Seventy percent are workers in the national economy, 16 percent are pensioners and disabled persons, 7 percent are students, and 7 percent are in other categories. Most of the patients are women (67 percent). Thirty-three percent of the individuals are under 30 years of age, 26 percent are between 30 and 40 years old, 18 percent are 40-49 years old, and 23 percent are 50 or older.

The main reasons for visits to a cost-accounting polyclinic are as follows: dissatisfaction with an examination and treatment in the polyclinic near the visitor's place of residence (25 percent), a desire to receive a higher level of care (34 percent), the absence of specialized physicians in territorial polyclinics (13 percent), a rough and uncaring attitude toward patients in those polyclinics (13 percent), the desire to have free choice of physician (6 percent), and others.

Individuals visiting cost-accounting consultation-diagnostic polyclinics were found differ in level of material security. Per-person family incomes are as follows: 75 rubles or less, 16 percent; 76-100 rubles, 28 percent; 101-150 rubles, 36 percent; 150-200 rubles, 12 percent; more than 200 rubles, 8 percent. Those data indicate that paid medical services provided by cost-accounting consultation-diagnostic polyclinics are accessible to all population groups, regardless of their level of material security.

One of the most important aspects of the activities of cost-accounting consultation-diagnostic polyclinics is the setting of prices for the services they render. Existing rates for paid medical services rendered by cost-accounting consultation-diagnostic polyclinics do not correspond today to actual material and labor outlays, and they do not take into account the rise in wages among health care workers, the use of new, expensive equipment, the rise in prices for materials and tools used, the actual labor outlays, or the high consumer demand.

When we compare the rates on individual types of medical services that are charged in various cities of the country, we see substantial differences in the amounts paid for the same types of health care.

An analysis of the activities of cost-accounting outpatient-polyclinic facilities shows that intensification of economic management methods, utilization of full cost-accounting and self-financing, expansion of democratic principles, and development of self-management are common objectives. The USSR law "On the State Enterprise (Association)" must be extended to cost-accounting health care facilities in its entirety, to include the right to elect their own director, to form economic incentive funds, to introduce leasing relations, and to grant independent legal status to enterprises, which would maintain their own accounts with the USSR Gosbank.

The current practice of transferring all profits made by cost-accounting health care facilities into the state budget should be considered a complete contradiction of the principles of cost accounting.

Cost-accounting consultation-diagnostic polyclinics need to expand their space, modernize their medical equipment, and introduce modern methods of research and therapy, including computerized tomography, ultrasound diagnosis, dopplerography, angiography, isotope diagnosis, cryo- and electrosurgery, etc., which is why their monetary profits should remain in their possession and they should be provided with modern medical equipment and servicing. It is recommended that health care agencies make it a priority to review the prices on paid services, so as to ensure profitability of cost-accounting consultation-diagnostic polyclinics.

From our standpoint, in light of the intensive development of the network of medical cooperative facilities and the increased number of individuals engaged in private labor, we need to focus on improving the activities of cost-accounting health care facilities that provide paid medical services to the population at prices that, as a rule, are considerably lower. The transition of cost-accounting health care facilities to real use of cost-accounting principles and of the rights spelled out by the USSR law "On the State Enterprise (Association)," plus the extensive introduction of leasing contracts into these facilities, will lay the groundwork for more effective activity and will make it possible to raise the ability of those facilities to compete.

Tasks Facing the Republic's Health Care Sector in the Struggle to Lower the Incidence of Infectious Diseases

907C0408 Alma-Ata ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 9, Sep 89 pp 1-7

[Article by Kazakh SSR Minister of Health T. A. Izmukhambetov]

[Text] After the recent 17th All-Union Congress of Microbiologists and Epidemiologists, a number of additional measures were implemented in the republic to intensify protection of the environment and to safeguard public health. A Health Protection Center was created with the objective of consolidating the efforts of collectives from hygienic and epidemiological scientific research institutes, certain institutes of the Kazakh SSR Academy of Sciences, and practical health care institutions and agencies to solve the problems of disease prevention.

In connection with the expansion of the tasks placed before state health inspection organs and with the restructuring that is under way in health care, the structure of republic and oblast medical-epidemiological stations has been altered and preventive social hygiene departments created. They have been called upon to study the influence of environmental factors and factors of the social infrastructure upon the health of the residents of each specific region, and then to use that information to develop priority and integrated long-range measures. The medical-epidemiological service is participating in an economic experiment in certain territories, and brigade forms of work are being introduced. Steps are being taken to improve the material-technical base of medical-epidemiological facilities and to provide them with modern equipment.

The volume of research aimed at monitoring the environment and the immunological status of urban and rural residents has increased considerably. The total number of bacteriological tests performed has risen. It was 13,486,000 in 1988. They were primarily health-service bacteriological analyses. The percentage of those tests was 53.0 percent, as compared with 49.6 percent in 1987. The volume of virological tests increased by a factor of 1.3, reaching a total of 109,700.

The systems of epidemiological control of measles, diphtheria and poliomyelitis have experienced a new upswing in their development. For example, the number of serological tests for immunity to diphtheria and tetanus increased by more than 14,000 (from 58,589 in 1987 to 72,259 in 1988), while the number of tests for immunity to measles increased to 40,000 from 7,000.

Special attention has been devoted to introducing new testing techniques and diagnostic preparations. Among the techniques that have become widely used in recent years are those for hepatitis B surface antigen testing, those for detection of coliphage as an indirect indicator of viral pollution of water basins, those for rapid diagnosis of diseases of staphylococcal etiology, and those for detection of dysentery antigens.

A number of measures to improve state sanitary inspection and raise its efficiency have been implemented, and work on regional Zdorovye [Health] programs is proceeding vigorously.

The consistent decline in infectious morbidity is a result of the multifaceted activities of health care agencies and institutions, including the medical-epidemiological service. In four years of the 12th Five-year Plan, morbidity in the republic as a whole decreased by 20.7 percent for typhoid fever and 10.7 percent for acute intestinal infections, including 28.1 percent for bacterial dysentery. It decreased by a factor of 2.5 for mumps, 46.5 percent for measles and 10 percent for brucellosis. Morbidity due to tetanus, poliomyelitis, whooping cough and rickettsiosis is being kept at a sporadic level, and there have been no local cases of malaria despite the annual importation of that infection into the republic; nor have there been any complications associated with cholera or quarantine infections.

Despite the undoubted success in the struggle against infectious diseases, they are still relatively widespread, and some are even at a high level. The role of various infectious diseases as factors causing social and economic losses remains considerable in that regard. Each year, around 2.9 million cases are recorded (including influenza and acute respiratory viral infections). It costs the republic 343 million rubles.

The epidemiological situation in relation to intestinal infections is determined primarily by the sanitary conditions of population centers, the condition of water supplies and sewerage systems, and the cleanliness of open water basins. Although the incidence of typhoid fever has decreased overall, its level is 1.6 times higher than the unionwide level (4.6 in 1988, as compared to 2.8 in the USSR). The situation is especially bad in oblasts of Kazakhstan such as Kzyl-Orda, Chimkent, Taldy-Kurgan, Dzhambul, Aktyubinsk and Guryev. The unsteady decline of typhoid fever morbidity in certain territories and its high indicators are eliciting serious apprehensions.

The distribution of acute intestinal infections is extremely irregular. If in the republic as a whole their level is below the unionwide level (531.6 in 1987 and 511.7 in 1988; for the USSR, 609.9 and 639.2, respectively), those figures were 798.8 and 754.9 in Kzyl-Orda Oblast, 603.1 and 690.4 in Pavlodar Oblast, 616.4 and 557.7 in Kokchetav Oblast, and 1,150.0 and 1,170.0 in Leninsk.

The last two years alone have seen six outbreaks of typhoid fever, five outbreaks of acute intestinal infections and three outbreaks of viral hepatitis associated with unsatisfactory condition of water supplies. The economic loss was 717,819 rubles.

Guaranteed water supplies remain an extremely urgent problem in the republic. To date, 70 percent of urban residents have centralized water supplies, while only 20-52 percent of rural residents have such water supplies. Water consumption norms are low by a factor of 3-4, and in Kzyl-Orda Oblast there are only 15 liters of water per rural resident. Consumption is less than 25 percent of the norm in Aktyubinsk, Guryev, Kokchetav and Chimkent oblasts. Water is trucked in to around 600 rural population centers. Some 14-35 percent of the water supply lines do not meet sanitary requirements, and 10.0-30.0 percent of drinking water samples do not meet the all-union state standard for bacteriological indicators; in a number of population centers, that figure is 80-100 percent. The very first analyses of water for coliphage revealed the presence of viral contaminants; in samples taken from the pipeline distribution networks of some population centers, the coliphage level was 1000 PFU/dm^3 or higher.

Because of the country's limited production of local water treatment units, their installation has become possible only on a few water supply lines. At the same time, drinking water coliphage standards have yet to be developed, which makes it extremely difficult to provide an epidemiological assessment of the condition of water supply lines, and that, in turn, prevents the imposition of sanctions on the appropriate agencies for failing to comply with operating procedures pertaining to water management structures and treatment systems (the standard is 100 PFU/dm^3 for open water basins).

The epidemiological role played by the presence of staphylococci, anaerobic spore-forming microorganisms and certain other infectious disease agents in drinking water is not completely clear.

Development of sewerage networks and structures is not proceeding fast enough, regular planned water treatment is being introduced too slowly, and intense pollution of rivers is continuing. The number of discharges of domestic sewage is virtually the same (63); of those incidents, the sewage was untreated in 30 percent. Eighteen percent of samples taken in the republic had elevated bacteriological levels. Such instances were 48 percent in Chimkent Oblast and 100 percent in Kzyl-Orda Oblast.

Outbreaks of dysentery have grown more frequent in recent years, which stems from poor-quality dairy products (in Rudnyy, and in Sogra settlement, East Kazakhstan Oblast). This is a consequence of the fact that inspection of milk-processing enterprises is inadequate. The levels of their sanitary engineering, production equipment, and refrigeration and steam are unsatisfactory. Product quality is low, and at certain milk plants, as much as 25 percent of the product fails to meed the all-union state standard in relation to bacteriological levels. The positive changes resulting from measures undertaken by the medical-epidemiological service are still negligible.

The etiology of acute intestinal infections remains an urgent problem, even though adequate attention is being devoted to it. For example, among acute intestinal diseases, those of established etiology increased from 26.3 percent in 1980 to 40.9 percent in 1988, and to 56 percent in a number of oblasts; that was the result of persistent training of bacteriologists and clinical workers and the development of a network of bacteriological laboratories. Nonetheless, those successes are clearly insufficient. Around 60 percent of acute intestinal diseases remain unidentified, which dooms the health service to carrying out "blind" measures. Practical health care has not yet received commercial rotavirus infection test kits, antibody test kits, or *Shigella* and *Salmonella* antigens. Laboratory diagnosis of campylobacteriosis is extremely difficult because of the absence of the appropriate equipment (anaerostats). Much is uncertain at the moment as to the epidemiology of diseases elicited by conditionally pathogenic microflora.

After a downward trend in 1980-1985, there was a marked growth of salmonellosis—by 19 percent in 1988. The economic losses to the republic caused by that disease are over 2.5 million rubles annually. Group infections and outbreaks associated with consumption of poor-quality food products manufactured by the public food services network have grown more frequent (four such outbreaks affecting a total of 178 individuals were recorded in 1988 alone).

Salmonellosis has become more widespread against the backdrop of intensive industrial poultry breeding. Large poultry factories have become the "suppliers" of salmonellosis as a result of gross violations of veterinary, sanitary and hygienic rules for the production of poultry products. The medical-epidemiological deserves a stern rebuke for its inability to provide for adequate preventive and ongoing inspection. Despite the measures that have been implemented, the state sanitary inspection system is not making adequate use of its rights, and it is not imposing stiff requirements for the creation of safe poultry-product manufacture in the public food services and trade network.

Change in the social and ecological conditions of the life of the people, industrialization of livestock and poultry raising, use of artificially prepared feeds containing readily infected ingredients, and wide use of antibiotics are having a substantial effect on the epizootic and epidemic processes of those infections and on their interaction, all of which makes the prevention problem very complex. We need quick methods to diagnose diseases and detect disease agents in the environment, and the actions to be taken by the medical-epidemiological service when it determines that a poultry farm is sending out infected products must be set in law.

In todays conditions, we need to find new, improved ways of studying the epidemiology of salmonellosis. The goal would be to ascertain the factors determining the particular features in the development of the epidemic process and to develop a scientifically sound system of measures to prevent and control such diseases.

When it comes to infectious pathology, viral hepatitis is the main problem in the republic. Its morbidity is constantly increasing, and it exceeded the union level by a factor of 1.6 in 1988 (402.0, as compared to 251.7 for the USSR). Morbidity is extremely high in Chimkent Oblast (773.2). Its increase has been noted this year throughout almost all of Kazakhstan.

The reasons for the high level of viral hepatitis A have been identified. One reason is the unsatisfactory condition of water supplies, especially in rural areas. The water factor in the hepatitis A transmission mechanism was responsible for disease outbreaks in Shchuchinsk (152 cases), among schoolchildren in the settlement of Balykshi in Guryev Oblast (225), in a number of population centers of Yeraliyevskiy Rayon (260), and in Urdzharskiy Rayon in Semipalatinsk Oblast (174). The water factor also continues to play a dominant role in the rest of the republic.

It is believed that children are the source of the high morbidity level (representing more than 40 percent of cases). Children's preschool facilities and schools have become centers of disease as the result of numerous violations of sanitary and hygienic rules, with overcrowding being the principal violation. Today, more than 63,000 children are in overcrowded schools and day care centers; nearly 600 of the republic's children's facilities are overcrowded by more than 20 percent, nearly 300 by more than 30 percent, and nearly 200 by more than 50 percent.

The lack of room in preschool institutions is especially acute in Leninsk (21.0 percent) and in the Semipalatinsk (11.7 percent), Chimkent (13.0 percent), Kzyl-Orda (10.8 percent) and Aktyubinsk (9.4 percent) oblasts. At the same time, after three years of the 12th Five-Year Plan, the Ministry of Public Education fell short by 39,000 places, or 25 percent, of its introduction plan (154,832 spaces were planned, while 116,233 were actually introduced).

The material base of children's preschool institutions and schools remains weak. Fifty percent of children are accommodated in makeshift buildings. A total of 234 schools are in a dilapidated state. There are 856,000

children attending classes in two shifts. More than 600 schools are working in three shifts. The issue of building enterprises to provide preprocessed food for schools is not being resolved satisfactorily in the republic, at a time when 2,987 (40 percent) of school dining rooms are designed to handle preprocessed foods, but, because of the absence of the latter, they must prepare meals from scratch. Only 30 percent of the school kitchens have hot water, and nearly 19,000 schools use trucked-in water. Problems involving repair of refrigeration and production equipment, 20 percent of which is broken down, are also not being solved well.

In the last few years, the morbidity associated with hepatitis B has increased by a factor of 1.7; at the same time, appropriate preventive measures involving organization of the diagnosis and treatment of the disease in outpatient-polyclinic institutions and hospitals have not been implemented in adequate volume. Sterilization of medical instruments remains the No. 1 problem, since 71 percent of the cases of hepatitis B infection are acquired in treatment-and-diagnosis procedures.

The republic's acute shortage of disposable syringes and of surgical, stomatological, gynecological and other instruments is a well-known fact. Production of test kits for the passive hemagglutination test and for enzyme immunoassay is increasing unacceptably slowly, and radioimmunoassay has been introduced in only one oblast. In addition, test kits for hepatitis A are in extremely limited supply. Moreover, they have not been developed at all for diagnosis of non-A,non-B hepatitis or for detection of viruses in the environment, primarily in drinking water and in food products.

It is also extremely important that we develop methods that are more effective for decontaminating drinking water and sewage, which is critical in terms of preventing hepatitis. The republic's scientists are taking an active part in an integrated program of scientific research within the Virusnyye Gepatity [Viral Hepatitis] program, and we would hope that their search will answer many questions concerning the etiology of viral hepatitis, that new, effective means and methods of controlling the disease will be found, and that recommendations will be developed for the practical health care sector. The system for maintaining records on viral hepatitis also needs to be put in order, with records on all nosological forms being maintained separately (using Form 85).

A degree of success has been achieved in the republic in the struggle with infectious diseases. Over the last 30 years (1959-1988), morbidity has decreased by a factor of 287.5 for diphtheria, 85.7 for poliomyelitis, 125.3 for whooping cough, 16.4 for measles and 5.7 for tetanus. Unfortunately, however, we have been unable to maintain the momentum and stabilize the positive results. These infections are recorded in frequencies that range from sporadic cases (poliomyelitis, tetanus) to group illnesses and outbreaks (diphtheria, measles). The results that were achieved were obviously perceived locally as a kind of limit, which led to a false sense of security, a diminished sense of responsibility, and weaker demands made of medical workers, who are supposed to ensure the quality of diagnosis, treatment and preventive vaccination.

The high mortality rate associated with diphtheria elicits especial alarm: 20 out of 191 patients died in 1981-1988 (for a 10.5 percent mortality rate). One out of every 10 patients dies. And that, when there are specific preventive and therapeutic means that are not available for other infections (poliomyelitis, measles). All cases of death due to diphtheria are on the conscience of the treatment network's doctors.

In 1988, morbidity associated with diphtheria was double that in 1987: a total of 64 cases were recorded, as opposed to 33. An especially alarming situation has developed and persists with diphtheria morbidity in the Guryev, Ural and Chimkent oblasts.

Morbidity associated with poliomyelitis elicits no less concern. The treatment network's total lapse of attention with regard to that serious illness is alarming. In most stricken children, the diagnosis is established on the day 22 or later—after as much as one or two months. Patients are not receiving prompt orthopedic treatment, and they remain at home for a long period of time, serving as a dangerous source of infection for those around them. The fact that vaccine-associated poliomyelitis has been recorded in the republic also raises concern.

Measles assumed epidemic proportions in 1988: morbidity was double that of 1987, at 49.0 per 100,000 residents as opposed to 22.0. There were outbreaks in a number of children's collectives in the Taldy-Kurgan, Chimkent and Tselinograd oblasts.

Serious flaws in immunization work and too small a number of immunized individuals are the main causes of complications in the epidemiological situation with regard to those infections. The situation is aggravated by interruptions in deliveries of vaccines; for more than six months, Kazakhstan's treatment network did not receive any DTP, measles vaccine, or tuberculin.

Planned research on immune status in relation to diphtheria, poliomyelitis and measles has been widely conducted in the republic since 1983, and the volume of research is increasing; 10-18 percent or more nonimmune children are have been identified. However, to date, the next step to be taken by practicing physicians with regard to immunization tactics has not been determined. When nonimmune children are identified, only they are immunized, and the state of collective immunity is not considered. Given the shortage of medical instruments and the threat of the spread of AIDS, the performance of such mass examinations (5,000-7,000 per oblast, 50,000-60,000 in the republic) is irrational unless subsequent fundamental measures to correct immunity are implemented. In addition, the quality of the diphtheria and tetanus test kits being produced is below that required.

One of the most important problems is prevention of influenza and acute respiratory viral diseases. Five types of influenza vaccine have been developed in the republic. But the problem remains critical, nonetheless. Each year, the republic receives over a million doses of vaccine. Their cost is over 500,000 rubles. However, implementation of the immunization program is complex, and there's not enough equipment. There is nothing to inject inactivated vaccines with, because disposable syringes are unavailable, and because use of jet injectors has been prohibited they are unsafe in terms of HIV transmission. Nor are there enough atomizers to administer live vaccines. If another influenza epidemic were to occur in 1989-1990, practical health care will be defenseless. To make matters worse, no specific or nonspecific means have been developed for preventing all groups of acute respiratory disease.

In this republic, which is the worst in our country in terms of brucellosis, morbidity was lowered in 1988—for the first time in five years. But under no circumstances can we relax. The level remains very high—13.0 (as opposed to 1.8 in the USSR as a whole). Morbidity among humans stems from extensive occurrence of that infection among animals, from gross violations of brucellosis-control procedures, and from failure to carry out sanitary and veterinary measures.

It should be noted that there are, in fact, some pluses at this stage. For example, health care agencies have stepped up considerably their work in the solution of problems associated with the improvement of conditions at livestock breeding farms, in the creation of safe working and living conditions for livestock breeders, and in the determination of the true epizootic situation in the republic. New work methods are being developed and introduced, particularly an epidemic control system, and a new "transport medium" is being utilized for the purposes of laboratory diagnosis of disease. It was developed by the Kazakh Scientific Research Institute of Epidemiology, Microbiology, and Infectious Diseases. "Selective medium" control of the safety of milk has begun. This innovation was proposed by the Central Asian Scientific Research Antiplague Institute. The first positive results in analysis of sheep's milk in so-called "safe" farms have been obtained. Tests on a new brucellosis vaccine are being conducted in seven of the republic's oblasts.

In Kazakhstan, natural foci of Crimean hemorrhagic fever have formed in the Dzhambul, Chimkent and Kzyl-Orda oblasts. This year, 86 cases were recorded, as opposed to 13 last year. An outbreak of that infection was detected in Sarysuyskiy Rayon, Dzhambul Oblast. More than 60 individuals fell ill, and seven of them died. The causes of the outbreak lie in the rapid acceleration of formation of the focus, in the poor organization of the veterinary service's work, in gross violations of safety practices associated with the bathing and shearing of sheep, and in lapse of attention paid to that infection on the part of medical workers.

There are no substantiated explanations thus far for the rapid formation of natural foci. In light of the great abundance of ixodid ticks in that region and their high concentration around livestock breeding farms, shearing stations, etc., we need to see to it that the individual health care services and the Gosagroprom do not grow lax in the implementation of the entire complex of veterinary and sanitary measures (treating animals, cleaning buildings, monitoring adherence to safety procedures, and so on).

The situation in regard to a number of other infectious diseases is still unsettling: anthrax, leishmaniasis, tick-borne encephalitis and tuberculosis. The incidence of pediculosis is high in certain inhabited regions, and cases of typhus fever are recorded each year. All of that requires immediate measures.

One of the main objectives of epidemic control is to improve the system of epidemiological services to the population so as to achieve a maximum impact with the lowest possible material and labor outlays. And that in turn is impossible without scientifically substantiated recommendations.

It is no accident that the regular 18th All-Union Congress of Epidemiologists and Microbiologists is being held in Kazakhstan, considering the exceptional importance of the fight against infectious diseases in the republic. We hope that comprehensive discussion of the problems facing the country's scientists and practical health care will help to solve those problems.

UDC 610.63(574.3)

Morbidity With Temporary Disability Among Health Care Workers in Karaganda Oblast

907C0405 Alma-Ata ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 10 Oct 89 pp 13-15

[Article by V. I. Svetlichnaya, S. G. Tusupbekova and T. Ya. Yeremeyeva, Institute of Industrial Hygiene and Occupational Diseases, KazSSR Academy of Sciences]

[Abstract] A study of morbidity with temporary disability among medical personnel in Karaganda Oblast focused on the period 1983-1987. There are 36,000 employees in health care in Karaganda: 87.8 percent of them are women. Physicians represent 21.9 percent, mid-level medical personnel, 44.5 percent. The following represent some of the observations made: most of those ill were in the age groups 30-39 (32.8 percent) and 20-29 (29.3 percent). Junior workers with less than five years of service accounted for 28.1 percent; older individuals (more than 20 years on the job) accounted for 23.3 percent. On the average, during the study period, there were 66.9 cases with 1010.5 days of temporary disability for each 100 workers; daily the absenteeism amounted to 4 percent of all employees. Average duration of the

absence was 12.1-12.3 days. Respiratory problems took the heaviest toll: 22.4 percent, followed by care of sick relatives (21.1 percent), cardiovascular problems (10.7 percent), gastrointestinal disorders (5.4 percent). Among the respiratory illnesses, 70.8 percent consisted of acute respiratory illness, bronchitis, angina, influenza. Nurses showed a fourfold higher level of temporary disability than did physicians; physicians accounted for 43.5 percent of all tuberculosis cases among medical personnel. A conclusion was reached that better medical care must be provided for the children in local hospitals, and the working conditions of medical staff should be improved. References 3 (Russian).

UDC 615.471.03:616-073.756.8:681.31

Initial Experience in Use of Mobile Computerized Tomography in Our Country

907C0376 Moscow VESTNIK RENTGENOLOGII I RADIOLOGII in Russian No 5, Sep-Oct 89 (manuscript received 1 Jun 89) pp 85-87

[Article by L. M. Portnoy, Moscow Oblast Scientific Clinical Research Institute imeni M. F. Vladimirskiy]

[Abstract] The first mobile computerized tomography unit in the USSR has been in operation in Moscow since the summer of 1988. It is a General Electric CT-Max unit. Moscow was chosen because its social infrastructure mirrors that of many other regions in the country: primarily industrial, with a well-developed railroad and highway network, plus rural areas on the outskirts. The new technology has proven itself completely. During the first year, 3,075 examinations were performed, with pathology identified in 2,408 patients (74 percent). Brain scans represented 60 percent of all examinations, and they detected 343 tumors and 154 injuries. The remaining 40 percent were for such problems as abdominal and urological pathology, pulmonary and mediastinum diseases, and endocrine disorders. It was estimated that, in terms of workload, the mobile unit performed the equivalent of three stationary units. One of the more vivid examples of the usefulness of the equipment was its use after the Armenian earthquake. More than 200 examinations were performed in two weeks at the disaster site, facilitating timely treatment of the casualties. The absolute need for qualified personnel, spare parts, consumable goods was stressed as the prerequisite for proper performance in the future. References 16: 11 Russian, 5 Western.

Mass Health Screening—A Means of Improving Internal Medicine for Rural Population

907C0460A Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 11, Nov 89 (manuscript received 29 Mar 88) pp 3-5

[Article by A. S. Babadzhanov and P. R. Menlikulov]

[Abstract] The predominance of a rural population in UzSSR, as well as that republic's climate, geography and industry, require different methods of organizing the republic's mass health screening. The researchers here analyzed data characterizing the morbidity level of the people living in stock-breeding areas. Their study was conducted in 1984 in the Tamdynskiy Rayon, which served as an experimental bases for developing the forms and techniques of screening most suitable for inhabitants of such areas, especially for shepherds and their families. The frequency of certain chronic diseases was found to be at a level of 667.8 per 1,000 adults. The morbidity level fluctuated from 377.7 for ages 15-19 to 1407.3 for those 60 and over. The morbidity indices were higher among women than men. Five classes of chronic diseases dominate: digestive (15.9 percent), respiratory (15.2 percent), circulatory (14.4 percent), nervous (13.1 percent), and locomotor (7.9 percent). Based on the study, medical dispensaries and rural district hospitals have been set up in the central farm areas of the republic's sovkhozes and kolkhozes. The central rayon hospital has been provided with special departments for areas such as cardiology and gastroenterology. Mobile medical aid teams have been created for treatment and diagnosis of individuals who cannot travel to hospital facilities.

UDC 574:539.1.04

Genetic Consequences of the Chernobyl Accident

907C0470A Yerevan BIOLOGICHESKIY ZHURNAL ARMENII in Russian Vol 42, No 9-10, Sep-Oct 89 (manuscript received 26 Jun 89) pp 875-878

[Article by V. A. Shevchenko, Institute of General Genetics imeni N. I. Vavilov, USSR Academy of Sciences, Moscow]

[Text] A study of genetic effects stemming from the ionizing radiation that was released in the Chernobyl Atomic Energy Station (AES) accident is being conducted by research associates from the Institute of General Genetics imeni N. I. Vavilov, USSR Academy of Sciences. The researchers are using laboratory radiation-sensitive test-subjects to conduct biological dosimetry of the environment; they are evaluating primary radiation-genetic effects stemming from the action of ionizing radiation on the populations of plants and animals within a 30-kilometer radius and outside it; and they are studying the long-term genetic consequences (in a number of generations) of the action of ionizing radiation on environment objects.

*For analysis of the mutation process in indigenous populations of plants and animals in the region of the Chernobyl AES (within a 30-km radius and outside it), 25 experimental sectors were plotted out in 1988 for the purpose of conducting complex multiyear ecological-genetic research. There experimental material is being collected on 20-25 species of wild plants and on animal births, primarily mouse-type rodents and fruit flies (*Drosophila*). Moreover, radiosensitive laboratory subjects have been distributed at a number of sites—* Tradescantia *clone 02 and laboratory mice. This work presents some of the results of research conducted in 1986-1988, the findings of which have been previously published only in part.*

Experiments with *Tradescantia* clone 02 can serve as an example of the realization of the first area of research mentioned above.

Tallying of somatic mutations was conducted on HSF (hairs from stamen filaments) from that plant's flowers. A change in the color of the cells in the hairs from violet-blue to rose was recorded. From June through August 1986, the number of mutations induced by radioactive contamination in plants set out in boxes at sites with gamma radiation dose rates of 0.3, 5.0, and 15 millirad (mrad)/hr was calculated daily. Simultaneous analysis of the mutagenic process was conducted on *Tradescantia* control plants. The average percentages of mutations for that period were 0.23, 0.6, and 1.1 percent, respectively. In the control, it was 0.2 percent.

In 1987, *Tradescantia* plants were set out at sites with higher dose rate levels: 20, 100, and 250 mrad/hr. The maximum number of mutations in that experiment was 25 percent. On the whole, based on results from the two experiments, one can conclude that a reliable increase in the number of mutations induced by radioactive emissions occurs even at a dose of 5 mrad/hr, i.e., approximately 0.1 rad/day.

The level of the mutation process was studied in indigenous populations of *Arabidopsis thaliana,* which is widespread in the accident zone.

In 1986, a total of 10 populations growing with gamma radiation dose rates of 0.3-240 mrad/hr were analyzed (the dose rate of beta radiation was several times higher than the dose rate of gamma radiation). Only in two populations, which were more highly contaminated with radionuclides (60 mrad/hr and 240 mrad/hr), was there a statistically significant excess in the frequency of embryonic fatalities as compared with the control. Later, in 1987 and 1988, observations were conducted of the level of the mutation process in investigated populations of *Arabidopsis.* It was found that at sites with a high initial level of radioactive contamination, the frequency of lethal mutations remained at a relatively high level or even increased over a period of three years, regardless of an overall decrease of several dozens of rads in the radioactivity level during that time. For example, for population No. 1, the gamma radiation dose rate was 240 mrad/hr in 1986, 2.5 in 1987, and 2.0 in 1988. In that population, the frequency of M_1 plants that yielded progeny depleted by embryonic fatality, changed from year to year in the following manner: 12.2 + 3.1 percent, 27.3 + 6.3 percent, and 41.0 + 4.9 percent. In the control populations, it was was usually 1-5 percent of lethal mutations. In populations growing at sites with a relatively low level of initial radionuclide contamination (about 10 mrad/hr or lower), the level of mutations in subsequent generations did not differ significantly from the level of mutagenesis in the control populations.

In 1989, a study was conducted of the genetic structure of 16 populations of *Arabidopsis* growing within the 30-km radius of the accident, on the basis of the electrophoretic variability of the alleles of nine enzyme systems: Got, Idh, Lap, Ap, Est, Pgm, 6-Pgd, Kdh, and Per. Out of 17 studied loci, genetic mutation was identified in 14. An indicator of intra-population variation was calculated for polymorphic loci. Genetic analysis was conducted for a number of polymorphic loci (Lap-2, Ap-2, and Idh) to ascertain the co-dominant character in the inheritance of identified alleles. Analysis of the structure of *Arabidopsis* populations by biochemical markers indicated a depletion in the genotype composition of populations growing at sites with a high level of initial contamination (about 200 mrad/hr or higher).

For conducting cytogenetic research in the accident region, *Crepis tectorum* was used as an indigenous test-subject. That plant has four pairs of large, well-differentiated chromosomes. Studies conducted with that subject over a period of two years have made it possible to establish that the frequency of chromosome aberrations in seed plantules (in all, 20,000 metaphases have been analyzed) increases with dose rate. For the

second and third years of chronic irradiation, the appearance of plants with altered karyotypes has been characteristic. Those plants are heterozygous for "vital" aberrations that are capable of overcoming mitotic and meiotic selection. The appearance of karyotically changed plants provides evidence of active microevolutionary processes in chronically irradiated populations.

Research to evaluate the frequency of cells with chromosome aberrations in the root meristem of *Taraxacum officinale* Web. ex Wigg. and *Ocnothera biennis* L. seed plantules indicated their linear dependence on the dose rate.

A study of the genetic effects caused by ionizing radiation was done on three indigenous populations of fruit flies from sites with varying levels of contamination. *Drosophila melanogaster* were caught in June 1986 at sites with gamma radiation dose rates of 80.6 mrad/hr and 0.2 mrad/hr. In analysis, the levels of dominant fatalities were found to be 14.7 + 0.4 percent, 9.3 + 0.3 percent, and 6.2 + 0.2 percent of fatalities, respectively. That attests to the fact that the highest frequency is characteristic of populations from regions with the highest levels of background radiation. The indicated values reliably exceed the level of dominant fatalities in the control population (4.3 $\pm$ 0.1 percent).

In an evaluation of genetic effects on mouse-type rodents, it was established that the frequency of chromosome disorders in all populations living in contaminated sectors was reliably higher than in the control population. The most detailed analysis of genetic effects was conducted on *Mus musculus* (house mice), which were caught at three sites that differed in the following manner in terms of gamma radiation dose rates: 0.1-0.15 mrad/hr, 1-2 mrad/hr, and 60-100 mrad/hr, respectively. Symptoms of radiation sickness were not observed in the animals. All the males were bred with F_1 laboratory females (CBAxC57B1). The average litter size did not vary by site and consisted of 8.5 baby mice per female. In all, more than 2,000 progeny were obtained. A study of the frequency of dominant fatalities in males did not reveal any differences between animals from different sites. Nor did analysis of the frequency of anomalous sperm heads in males reveal any significant differences between groups. A study of the frequency of RT (reciprocal translocation) indicated that in mice caught at sites 2 and 3, the frequency of translocation was higher (0.37 percent and 0.43 percent, as compared with 0.17 percent at site 1).

In May-June 1987, mature males (CBAxC57B1)-F_1 were exposed at three sites near the Chernobyl AES. The length of exposure was 25 days. The total doses of gamma and beta radiation absorbed in the gonads consisted of 10 rad at site 1, 70 at site 2, and 2,500 at site 3. A study of the accumulation of radionuclides in animals' bodies showed that even at the maximally contaminated sites, the dose from internal radiation consisted of no more than 1 percent of the total absorbed dose. Analysis of the fertility of males after the the end of the exposure showed that all males from the maximally contaminated site were irreversibly sterile. Animals from site 2 were observed to be temporarily sterile for 30-40 days after the end of the exposure. The fertility of animals from site 1 did not differ from that of the control group. The frequency of RT was analyzed in 6,884 metaphases from 44 males that had been exposed at sites 1 and 2. The level of RT was relatively low (it did not exceed a fraction of a percent) and was independent of the exposure site.

For determining primary genetic effects in populations of fish living in the Chernobyl AES's cooling reservoir, which was contaminated with radionuclides, the frequency of chromosome aberrations in epithelial cells of carp eye corneas was evaluated. In May 1986, the frequency of cells with chromosome aberrations in carp living in that reservoir was 3.1 + 0.3 percent, and in the control reservoir, 3.0 + 0.2 percent. In 1987, it was 3.6 + 0.5 percent in the irradiated population. It follows from that that in populations of fish from the Chernobyl AES cooling reservoir, a marked increase in genetic damage due to the activity of ionizing radiation is not expected.

The obtained results have confirmed a previously conducted analysis of more than 20 years of research on evaluating the genetic consequences of the chronic exposure to beta radiation of ^{90}Sr—^{90}Y among indigenous populations of microorganisms, plants, and animals. Even before the Chernobyl accident, it had been established that with a dose rate on the order of 0.1 rad/day or higher (about 40 rad per year or higher), as a rule, one or another genetic effect would be successfully recorded (chromosome disorders in number and structure, various types of point mutations); however, such levels of radiation do not lead to any substantial genetic consequences for indigenous populations. The process of ecological displacements that are associated with the dying off of sensitive species and the restructuring of the irradiated communities, begins at higher dose rates of chronic radiation—1 rad/day or higher. Studies conducted at Chernobyl have made it possible to confirm those evaluations of dose rates of rare ionizing radiation that induce statistically significant genetic effects in populations. Moreover, unique information on the initial processes of radiation damage to subjects in natural ecosystems has been obtained.

UDC 577.391.615.37.599.323.4

Anti-Infection Action of Immunoglobulins in Irradiated Organism After Delayed Administration

907C0547A Moscow RADIOBIOLOGIYA in Russian Vol 29 No 6, Nov-Dec 89 (manuscript received 10 Jan 89) pp 817-820

[A. M. Ulanova, T. D. Kuzmina, G. A. Shalnova, A. N. Belchenko, V. M. Korshunov, and A. A. Ivanov, Institute of Biophysics, USSR Ministry of Health]

[Abstract] The search continues for new, effective pathogenic means of combatting infection in an irradiated organism. The correction of post-radiation immune deficiency was studied by using exogenous immunoglobulins administered just prior to full-blown radiation sickness, that is, much later than the usual use of immunoglobulin in the first few hours and days after irradiation. The ability of exogenous immunoglobulins to increase resistance to *E. coli* infection was also assessed in more than 1,000 CBA and (CBAxC57Bl)F_1 mice that were exposed to ^{137}Cs γ-radiation (8.13-8.64 Gy and 6.7 Gy). Homologous immunoglobulin was administered to the mice 5, 7, and 9 days after irradiation, and its effectiveness was assessed on the basis of 30-day survivability, occurrence of post-radiation endogenous infections, and development of dysbiotic complications in the small intestine. Heterologous immunoglobulin was administered once or twice during a period spanning 4 hours to 5 days after irradiation, and its effectiveness was assessed on the basis of survivability. The researchers found that delayed therapeutic use of heterologous and homologous immunoglobulin had an anti-radiation and anti-infection effect and increased the survivability of the irradiated mice. References 3 (Russian).

UDC 577.391.591.44.591.433

Study of Role of Biogenic Amines in Neurohumoral Mechanisms of Post-Radiation Gastrostasis in Rats

907C0547B Moscow RADIOBIOLOGIYA in Russian Vol 29 No 6, Nov-Dec 89 (manuscript received 24 Nov 88) pp 821-823

[V. I. Legeza, I. V. Markovskaya, and M. G. Shagoyan, Military Medical Academy imeni S. M. Kirov]

[Abstract] The role of biogenic amines in the neurohumoral mechanisms of post-radiation disturbances in gastrointestinal transit was studied in 155 albino male rats that were subjected to wholebody gamma irradiation (10 Gy) from a ^{137}Cs source. Several substances (e.g., reserpine, parachlorphenylalanine, piperoxane, haloperidol) were administered either prior to or after irradiation. Barium sulfate was used to show that the evacuation function of the stomach markedly suppressed by radiation. Because catecholamine and serotonin antagonists are able to prevent post-radiation disturbances of the motor-evacuation function of the stomach, it is suggested that radiation gastrostasis is associated with the catecholaminergic and serotoninergic mechanisms for regulating the gastrointestinal tract. It is hypothesized that the pathogenesis of post-radiation gastroparesis is complex and is associated mainly with disturbances in the dopaminergic and serotoninergic mechanisms for regulating the motor-evacuation function of the stomach. References 15: 6 Russian, 9 Western.

UDC 577.113.5

Nucleotide Sequence of the Genome and Complete Amino Acid Sequence of Tick-Borne Encephalitis Virus Polyprotein

907c0439 Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 15 No 11, Nov 89 (Manuscript received 30 Jan 88; after revision 13 Apr 89) pp 1504-1521

[Article by A. G. Pletnev, V. F. Yamshchikov, and V. M. Blinov, Novosibirsk Institute of Bioorganic Chemistry, Siberian Department, USSR Academy of Sciences; All-Union Scientific Research Institute of Molecular Biology, Koltsovo, Novosibirsk Oblast]

[Abstract] This paper sums up the work done on the structure of the coding regions of the TBE genome. For the first time, the structrue of untranslated regions of the genome and the primary structure of the viral polyprotein are determined. The researchers studied the Sofia strain of TBE. The deciphered structure of the genome represents the only source of information on the molecular bases of the structure of a flavivirus representative borne by ticks. The researchers used computer analysis to compare the amino acid sequences of the proteins of TBE and other representatives of the flavivirus family. The least resemblance was observed among low-molecular nonstructural proteins NS2A, NS2B, NS4B and virion proteins M and C. The greatest homology was observed in structures of proteins E, NS1, NS3, and NS5, with the homology quite high within one serological subgroup of the viruses. In viruses WN and Kun, for example, it was 92-95 percent; it was substantially lower in other subgroups. A similar picture existed for positions of potential protein glycosylation sites among representatives of various subgroups of flaviviruses. The polyproteins for TBE and yellow fever were the closest, with homology in proteins E, NS1, NS3, and NS5 at 42 percent, 42.3 percent, 45.5 percent, and 55.8 percent. Despite the differences in transmission, flaviviruses borne by mosquitoes and ticks are similarly organized in terms of genome and polyproteins, plus mechanisms of functioning in cells. There is also a high homology of proteins necessary for viral reproduction in cells. Figures 2, references 48: 7 Russian, 41 Western.

UDC 578.833.26:578.74]:616.831-002-022.7:578.833.26

Implication of California Encephalitis Antigen Complex Viruses in Pathology

907c0377 Moscow KLINICHESKAYA MEDITSINA in Russian Vol 67 No 9, Sep 89 (Manuscript received 7 Feb 89), pp 61-64

[Article by L. V. Kolobukhina, D. K. Lvov, A. M. Butenko, A. A. Kuznetsov, I. V. Galkina, M. S. Nedyalkova, V. V. Vladimirova, Yu. P. Rudometov, Instituteof Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] A systematic study conducted by the Center of Ecology of the Institute of Virology obtained data indicating a high level of population immunity (30 to 50 percent) to California encephalitis complex viruses in the Central European USSR, including Moscow. The purpose of the work reported here was to determine the significance of viruses of this complex in human pathology during the season of activity of blood-sucking carriers, plus the characteristics of the clinical picture of the disease. Blood sera were collected from fever patients in May-September of 1986-1987 in Moscow. Some 320 patients were studied in all. Of those, 20 were identified in which viruses of the California encephalitis complex had an etiologic role. They were predominantly young people (90 percent were under the age of 30) who fell ill between May and September. Most of the patients had left the city and reported being bitten by insects in the country. The course of the disease in all cases was moderately severe, including fever and malaise in one group of patients, serous meningitis in another group. Clinical manifestations varied from comparatively mild influenza to the development of neuroinfection. Final diagnosis must therefore be based on laboratory studies. References 6: 2 Russian, 4 Western.

UDC 616.155.392-06:616-092:[612.017.1-064]-022.7:578.828.6

Two Cases of Combined Pathology: Leucosis and AIDS

907C0378 Moscow GEMATOLOGIYA I TRANSFUZIOLOGIYA in Russian Vol 34 No 10, Oct 89 (Manuscript received 5 Apr 88) pp 37-40

[Article by N. N. Tsyba, Donets Medical Institute]

[Abstract] The researcher cites two cases of combined pathology—AIDS with acute myeloblastic leukemia, and AIDS with chronic myeloleukemia—observed in Dar es Salaam, Tanzania. The cases demonstrate the absence of effect on the hematological indices of the patients by the retrovirus. The thrombocytopenia observed in one of the patients is, in the opinion of the author, a manifestation of acute myeloblastic leukemia, inasmuch as the thrombocyte level was restored to normal after treatment and hematological remission. Data also indicate that the course of the leukemic process has been accelerated by HIV and that drugs such as cytosar, vincristine, cyclophosphamide, prednisolone, and hydroxyurea are ineffective in the AIDS patients. References 9 (Western).

UDC 577.212.3

Cloning and Expression of pol-Region of HIV in Escherichia coli

907C0368A Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 310, No 1, Jan 90 (manuscript received 24 Apr 89) pp 210-213

[Article by S. V. Shulenin, N. V. Tsareva, Yu. B. Sitnikova, A. F. Bobkov, and M. M. Garayev, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] The goal of the work described was the cloning and expression in *E. coli* cells of the fragment of the HIV pol gene which codes for protease and reverse transcriptase. The fragment coding for protease, reverse transcriptase and a part of integrase-endonuclease and bounded by the Bg1II and EcoRI sites was isolated from the pBH10 plasmid which contains the full-sized cDNA of HIV-1. When the fragment was incorporated into the pUC19 vector, its direction and reading frame corresponded to the β-galactosidase gene. Clones were elaborated whose transcriptase activity had been increased by a factor of more than 10. Extracts of the bacteria obtained were shown by the Western blot method to contain a protein which specifically interacted with HIV-1 antibodies. Electrophoresis showed that the protein had a molecular mass identical to HIV-1 reverse transcriptase. Reverse transcriptase activity was not seen in the absence of protease, which is needed for correct precursor processing. The bacterial extracts, both with and without vector, were more active than virus lysate toward polydeoxyriboadenosine-oligothymine, because of the presence of DNA-dependent DNA-polymerase. The cloned and viral transcriptases exhibited identical activities towards various matrices, with greatest activity towards polyriboadenosine-oligothymine. Bacterial and viral transcriptase had the same sensitivity to the inhibitors azidothymidine triphosphate, phosphonoacetic acid and phosphonoformic acid. The data indicate that the cloning has successfully produced a reverse transcriptase which does not differ from that of HIV-1. Studies of the enzyme's mutatory properties and a search for specific inhibitors are planned. Figures 1; references 10: Western.

UDC 616.98:578.833.26]-074

Clinical and Laboratory Characterictics of Illnesses Connected With California Encephalitis Virus Complex in Moscow Residents

907C0441C Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 10, Oct 89 (manuscript received 15 Mar 88) pp 68-73

[Article by L. V. Kolobukhina, D. K. Lvov, A. M. Butneko, A. A. Kuznetsov, I. V. Galkina, T. M. Skvortsova, M. S. Hedyalkova, A. I. Gromyko, V. F. Krylov, L. D. Knyazeva, V. V. Vladimirova, and T. N. Morozova, Institute of Virology imeni D. I. Ivankovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] Virological and serological studies have demonstrated widespread circulation of California encephalitis viruses in north and central sections of the European USSR and in east and northeast Asiatic regions. For this reason, a study was conducted on the role of California encephalitis viruses in febrile diseases among Moscow residents during May to September 1986. Blood samples were taken from 187 patients (ages 15-60) with preliminary diagnoses of acute respiratory disease, fever of unknown etiology, enteroviral disease, pseudotuberculosis and serum meningitis. Ten patients exhibited diagnostically significant changes in the neutralization index, indicating a role for the Tahyna or similar virus in disease etiology. Five of the ten were confirmed by fluorescent antibody results. Eight of the subjects reported recent mosquito bites during trips to a river or forest. All patients were 18 to 25 years of age. The disease began with acute chills, followed in several hours by fevers of 38-39°C and profound weakness. The febrile period lasted 2-9 days. All patients experienced headache, with pallor, scleroses and conjunctivitis seen in nine. Three patients developed pneumonia. The data demonstrate the utility of specific serological neutralization reactions in diagnosing encephalitis caused by California serogroup viruses, despite difficulties in speciating and typing the virus involved. References 18: 5 Russian, 13 Western.

Study of Serological Activity of Anti-HIV-containing Sera Under Different Conditions of Storage

907C0496B Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA BIOLOGICHESKAYA in Russian No 6, Nov-Dec 89 pp 51-55

[Article by V. E. Berezin and V. M. Zaydes; Institute of Microbiology and Virology, KaSSR Academy of Sciences]

[Abstract] The necessity for a 2-stage study of sera during AIDS diagnosis raises the problem of transportation and storage of many samples of the material being studied, since confirmation of the diagnosis requires many specialized laboratories. This problem becomes serious in view of the massive examinations of the population required for diagnosing AIDS and also because of the fact that bacterial contamination of sera during transportation and storage may cause false readings. A study of the serological activity of anti-HIV-containing sera under different storage conditions aimed at development of a simple and reliable system of storing and transporting serum under conditions which prevent bacterial contamination but which preserve the specific serological activity was described and discussed. Serum was applied to filter paper or chromatographic paper, dried and stored or transported in dried form. The serum must

be eluated in an appropriate buffer directly before analysis. Study of 18 samples of different categories of sera (anti-HIV-positive, false positive, negative) involved application of 10 µl of serum on chromatographic paper for 30 minutes at room temperature and storage in dried form for 1 month at 4°C or at room temperature. After 1 month, serum was tested in an Imuunoenzymic Analysis—AIDS test system. Sera of all categories could be stored in dried form at 4°C or at room temperature for 1 month without significant decrease of specific serological activity of antibodies to HIV proteins. This solved the problem of transporting and storing a large number of samples when repeated determinations of activity are necessary or for use in confirming tests. Use of the method reduces the number of bacterial contaminations and the number of false positive readings accordingly and facilitates supply of serum to the user. Serum samples can be shipped by mail. Figure 1; references 8: 1 Russian; 7 Western.

First All-Union Radiobiology Conference

907C0470b Yerevan BIOLOGICHESKIY ZHURNAL ARMENII in Russian Vol 42, No 9-10, Sep-Oct 89 p 960

[Article by Ts. M. Avakyan]

[Text] The All-Union Radiobiology Conference held in Moscow on 22-27 August 1989 was a large forum dedicated to the current state of Soviet radiobiology. Approximately 1,000 radiobiologists and specialists from related scientific fields took part in the conference.

The conference noted that in connection with the development of atomic energy and radiation technology and with the widespread use of ionizing radiation in scientific research, the role and importance of radiobiology as a basic science with tremendous practical significance have grown. The development of radiobiology is becoming a social necessity.

Domestic radiobiology, which originated in the 1950s and 1960s, has made a substantial contribution to the development of world science. Molecular and cellular mechanisms of the onset and development of radiation injury and natural and modified radiation resistance have been studied; the phenomenon of post-radiation restoration of cells has been discovered; the processes of DNA reparation have been studied, and their role in the destruction and survival of cells has been identified; the molecular mechanisms of the death of irradiated cells have been studied; the roles of radiation damage to the genome, of structural and functional disorders of biomembranes, and the participation of toxic substances inside the organism in the creation of radiation damage have been established. A theory of chemical protection of organisms from radiation has been developed, and a number of anti-radiation preparations and agents based on it have been proposed for practical application.

A multitude of works on the effect of ionizing radiation on hemopoiesis, the CNS, immunity, embryogenesis, and heredity were presented at the conference. A considerable number of works were devoted to applied radiobiology—particularly to studies in the field of molecular and cell radiobiology of normal and tumor tissues.

There was a broad ranges of works presented on radioecology—the behavior of natural and artificial radioactive elements in the environment and their migration, accumulation, and biological effect on the plant and animal world.

In connection with the accident at the Chernobyl Nuclear Electric Power Station, radiobiology must conduct further, in-depth study of such problems as the biological effect of plutonium, strontium-90, cesium-137, and other incorporated radionuclides and highly radioactive particles. A large number of papers on those questions were presented at the conference by Ukrainian and Belorussian scientists who have also investigated mechanisms of the development of long-term consequences of radiation exposure in small doses—carcinogenesis, teratogenesis, hereditary pathologies, etc.—for the purpose of developing measures for reducing the risk to large groups of people. The effect of natural background radiation, and its elevation by tens and hundreds of times, on biocenose and on various populations has been studied with an eye to accurately predicting the consequences of long-term exposure to ionizing radiation in small doses. The problem of the synergism of factors of a radiation and a non-radiation nature was particularly emphasized.

The conference pointed out a number of substantial flaws in the organization of fundamental radiobiological research. In the USSR, there is not a single center or institute that is involved in the development of fundamental research and in the practical introduction of the achievements of radiation-biological technology into industry, agriculture, or medicine. The conference also pointed out that domestic radiobiology lags substantially behind that of the rest of the world and that there are great deficiencies in the educaton of cadres of radiobiologists and in disseminating radio-ecological knowledge.

The first All-Union Radiobiology Conference sent an appeal to the Supreme Soviet and the USSR Council of Ministers concerning aspects of the further development of radiobiology in the USSR.

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Biological Experiments on Kosmos-1887 Biosatellite

907C0422A Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 5, Sep-Oct 89 pp 26-32

[Article by A. M. Alpatov, Ye. A. Ilin, V. V. Antipov and M. G. Tairbekov]

[Text] The Kosmos-1887 satellite was the eighth specialized biosatellite—that is, a spacecraft designed to accommodate biomedical research conducted during spaceflight. Diverse organisms were on board: bacteria, protozoans, plants, worms, insects, fish and amphibians. What the research on those biological subjects had in common was that it was geared toward further study of the biological effects of weightlessness, evaluation of the fundamental consequences of the loss of gravity, and ultimately the refinement of our ideas on the biological role of gravity. The program of biological experiments was a logical extension of research conducted aboard preceding biosatellites,[5] and it included a number of traditional areas: cell biology, genetics, and biological development. Besides that, recently initiated research on restorative processes was broadened, and a new area was added—biorhythmology.

The purpose of this article is to provide a brief, general survey of the basic results of those experiments, as they will be presented in greater detail by the appropriate groups of authors. Biosatellite No. 8 carried 10 rats and two monkeys; the physiological, morphological and biochemical studies done on those animals are beyond the scope of this communication.

Procedures

The flight of the Kosmos-1887 biosatellite lasted 13.5 days, from 29 September to 12 October 1987. The satellite's life-support system maintained the following environmental parameters: temperature 22-25°C, pressure 725-765 mm Hg, humidity 40-65 percent, pO_2 140-180 kPa, pCO_2 2-3 kPa. The biological subjects were kept in containers that shared the satellite cabin's atmosphere and in darkness, except for the *Infusoria,* which were kept in the incubator of the Tsitos-3 unit, and the inhabitants of the sealed Akvarium unit (*Chlorella* and guppies), in which a normal diurnal illumination cycle was maintained.

The biological subjects were placed in the containers, and the containers placed aboard the spacecraft, two days prior to the biosatellite's launch. The principal ground-based control (synchronous) experiment was conducted on a one-day lag behind the in-flight experiment, in an incubator that used information relayed by telemetry link from the satellite to reproduce the inflight atmospheric temperature dynamics within +/-0.1°C. Besides that, additional control and modeling experiments were conducted in conjunction with other experiments for the purpose of calculating the effects of certain spaceflight factors.

For technical reasons, the biosatellite landed near the city of Mirnyy, Yakut ASSR, in a region that was not included in the original plans. As a consequence, the biological subjects were not retrieved until one day after touchdown, during which time the cabin's air temperature dropped. The lowest temperature in the containers was 15°C, a temperature drop that was reproduced in the synchronous control experiment. None of the biological subjects (except the fish) suffered from the temperature drop.

Results and Discussion

The action of weightlessness at the cellular level was established for the first time on *Tradescantia* microspores: in-flight changes were detected in cell shape and size, the position of the nucleus, and cell division.[2] Those data have been confirmed by a number of Soviet and foreign researchers[8,11,15,19,20]; however, the question as to the mechanisms of those effects remains open.[9,12,15,17,18] In examining the possibility of a direct effect by weightlessness, one should keep in mind that, on one hand, the cell is a microscopic chemical reactor that functions according to the laws of thermodynamics and is independent of the presence of gravity, but that, on the other hand, the cell is a mechanical structure that undergoes stress in a gravitational field and, possibly, must expend a certain amount of energy to maintain "positional homeostasis."[9] It is possible that, in weightlessness, the cell's energy expenditures for the synthesis of cytoskeleton contractile proteins decrease, and the "saved" energy is redistributed and used for the activation of metabolism, particularly for the acceleration of cell division.[18]

An experiment with independent one-celled eukaryotic organisms—the ciliates *Tetrahymena pyriformis* (M. G. Tairbekov, I. S. Irlina)—was conducted in the Tsiros-3 unit, which was developed in France. The unit effected incubation of cell cultures and provided for periodic fixation of the biological material. Just prior to the experiment, lone cells were placed in small, plastic 1.2 ml packages [((berlingos))] containing axenic nutrient medium and ampules of fixative. Two berlingos were loaded simultaneously—flight (experimental) and ground-based (control). Two cells that had just divided (sister cells) were used for that, ensuring that the experimental and control biological material would be fully identical. The cells were initially maintained at 8°C. After the satellite was inserted into orbit, the temperature set at 25°C, which is optimum for division of infusorians. The specimens were fixed 0, 12, 24, 36 and 48 hours after orbital insertion. It was demonstrated that in weightlessness, accelerated division of *Tetrahymena* occurred, the cells acquired a more spherical shape, and

their protein content decreased, which is consistent with results obtained in earlier research on another infusorian—*Parameceum.*[18,19]

Data obtained on acceleration of growth and aging of *Wolffia* (V. M. Abramova) and on elevated levels of lipid peroxidation in cell membranes in a *Haplopappus* tissue culture (Ye. L. Kordyum, S. I. Zhadko) also indicate the possibility that cell metabolism is stimulated in weightlessness.

A lysogenic culture of the intestinal bacilli *E. coli* was used to assess the effect of spaceflight factors on the prokaryotic cell (the experiment was proposed and carried out by Moscow schoolchildren, ninth-grade students A. V. Letarov and S. V. Komarov). Moderated λ phage in *E. coli* culture is usually in an inactive (lysogenic) state. Its DNA is inserted into the genome of the host bacterium, and it replicates together with it. Physicochemical effects are capable of inducing the phage's transition to an active (lytic) state. Then the host cell is destroyed (lysis), and the formed phage particles emerge into the medium. A statistically reliable ($p < 0.01$) 3.2-fold increase in phage induction was established during the flight of the Kosmos-1887 biosatellite, which is consistent with previously obtained data[4] and is tentatively explained as the result of exposure to cosmic radiation.

The previous genetic experiments were conducted chiefly for the purpose of identifying the injurious effects of weightlessness on hereditary structures and evaluating the modifying effect of weightlessness on the development of radiation injury. The results obtained were published in a number of surveys.[1,3,7] The genetic experiments aboard the Kosmos-1887 biosatellite were geared to a new objective—assessing the role of the cell's genetic apparatus in its response to weightlessness and in the possible mechanism of adaptation to that factor. The stimulatory action of weightlessness mentioned above may be realized through regulatory change in gene activity. One proposed mechanism of adaptive restructuring in the genome is change in heterochromatization of individual DNA segments and repression-derepression of entire gene blocks. To test that hypothesis,[3] the frequency of meiotic crossing-over (the crossing of two chromatids of homologous chromosomes) at different loci on the same chromosome was assessed in *Drosophila.* Two lines of *D. melanogaster* were used—wild Oregon-R and a mutant line containing a chain of marker genes revealing themselves in phenotype (A. V. Smirnova). Analytical crosses were made after the flight. It was established that the frequency of recombination between genes ru-h and h-cu increases in weightlessness, whereas it does the opposite and decreases between genes cu-e. Inasmuch as it is known that the crossing-over frequency depends on the ratio between heterochromatin and euchromatin, the result of the experiment confirms the hypothesis.

Other possible mechanisms of genome activation are gene amplification and polyploidization of the nucleus. In order to assess the role of those mechanisms in the response to spaceflight factors, cytological research was conducted on oogenesis in insects—*Drosophila* (A. A. Neyfakh, T. A. Burakova)—and in amphibians—newts (L. V. Belousov, T. V. Ostroumova, N. L. Delone). No changes were revealed in the ovaries of *Drosophila,* meaning that participation of the polyploidization mechanism was not confirmed in that experiment. At the same time, an increase in the number and size of nucleoli was established in newt oocytes after the flight, an increase that occurred simultaneously with growth oocyte diameter, which attests to additional amplification of rDNA genes in response to spaceflight factors, including weightlessness. Thus, the hypothesis that amplification participates in the conjectured stimulatory effect of weightlessness is interesting, and it naturally requires further verification.

Cytological research was conducted on lymphocytes from the blood of *Macaca mulatta* monkeys (two flight animals and four control animals) before and after the spaceflight. The metaphases of the first and second mitoses were analyzed (S. M. Kuzin, A. P. Zhvalikovskaya, N. L. Delone). Chromosome disorders were taken into account in the first mitosis, and sister chromatid exchanges were taken into account in the second. It was demonstrated that the conditions of the spaceflight and of the return to earth caused a decrease in the percentage of dividing lymphocytes in the peripheral blood of the monkeys. Somewhat of an increase in the frequency of chromosome restructuring and of sister chromatid exchanges and a substantial increase in nucleolus-forming associations were detected in the flight animals. Those facts permit the hypothesis that the chromosome apparatus might also participate in the monkeys' adaptation to weightlessness and their readaptation to Earth's gravity.

Circadian (around 24-hour) rhythms are the biological basis for distribution of the organism's vital activities over time. As a rule, research on circadian rhythms in spaceflight has thus far been conducted against the backdrop of a 24-hour illumination schedule.[6,14,21] But lighting conditions unavoidably conceal or mask possible changes in circadian rhythms. In order to identify the effects of spaceflight factors in their "pure form," we must study the rhythm's spontaneous dynamics—that is, observe free-running circadian rhythms under constant conditions. The length of the free-running period in spaceflight was assessed for the first time in an experiment on the darkling beetle*Trigonoscelis gigas* aboard the Kosmos-1887 biosatellite (A. M. Alpatov, Yu. A. Yevstratov, V. B. Chernyshev). The beetles were kept in darkness in individual boxes. Their motor activity was recorded for 8-10 days before and after the flight. As a result of spaceflight, there was a statistically reliable shortening in the period of free-running circadian rhythms in seven out of eight beetles. Gradual restoration of the length of the period to its baseline (preflight) magnitude was observed in two beetles after landing. After the flight, the same animals were used in a control experiment that reproduced the vibrations typical of the

powered legs of the flight (take-off and landing) and the temperature drop that occurred following landing as a result of the biosatellite's touchdown in a non-target region. Neither factor had an effect on the period of the circadian rhythm, which allows us to ascribe the identified effect primarily to weightlessness. That effect is important, inasmuch as the period of the circadian rhythm is a fundamental description of the body's circadian system. The magnitude of the period is also known to be subject to homeostasis and depends very little on external factors, with exception of those that serves as periodic time signals (light and, more rarely, temperature). It stands to reason that gravitation is not included among the latter, and therefore that effect is somewhat unexpected. At the same time, it is known that lengthening of the period of the circadian rhythm is observed in monkeys in response to prolonged exposure to accelerations on a centrifuge.[13] The possibility is not excluded that the period of the circadian rhythm may turn out to be yet another gravity-dependent biological parameter of the body. In any case, the observed reduction of the spontaneous period in beetles permits the hypothesis that, during spaceflight, the body's biological needs change in terms of duration of intervals of activity and rest and in terms of duration of optimum "space days."

Earlier study of embryogenesis in spaceflight led to the conclusion that if weightlessness does influence development, it does so only at its earliest stages, prior to gastrulation, and even so the disturbances are adjusted later on.[5] In the meantime, an experiment conducted by the European Space Agency during the flight of Spacelab-D1 revealed that weightlessness has a deleterious effect on embryonic development in insects, especially on determination of its stage.[10] That experiment was reproduced during the flight of the Kosmos-1887 biosatellite; embryos (I. A. Ushakov, A. M. Alpatov, Yu. A. Zakhvatkin) and hatched larvae (Kh. Byuker, D. Mesland, G. Khornek, G. Rayts) of the Indian walking stick *Carausius morosus* were studied after the flight. The eggs of the insect, ranked by age, were selected for the experiment to identify the most vulnerable periods of development. After the flight, stage-by-stage fixation of the biological material provided information on the dynamics of the manifestation and compensation of the effects of spaceflight factors. Detection of tracks made by charged particles made it possible to assess their injurious effect on insect development. It was found that embryonic development *per se* is not a function of the action of spaceflight factors: no abnormalities, deviations or delays in development were found during flight, even when the eggs were struck by heavy charged particles of cosmic radiation. At the same time, a sharp decline in the percentage of hatching larvae was identified after the flight, as was a statistically significant increase in the frequency of morphological abnormalities; a combined effect was noted from weightlessness and heavy charged particles. The possibility is not excluded that weightlessness may elicit latent developmental deviations that manifest themselves in later stages. It would be suitable to study larval hatching more carefully during and after weightlessness as a potentially critical stage of ontogenesis vulnerable to spaceflight factors.

Regeneration—the process of restoration of damaged tissues and organs—became an object of study for spaceflight only recently. In an experiment on the Spanish newt *Pleurodeles waltlii* aboard a previous biosatellite, Kosmos-1667, it was demonstrated for the first time that regeneration proceeds normally in weightlessness and that acceleration of regeneration and an increase in cell proliferation in the blastema are observed a few days after touchdown.[16] A repeat experiment carried out aboard the Kosmos-1887 biosatellite (designed by V. I. Mitashov, E. N. Grigoryan, E. A. Oygenblik) confirmed those data. In addition to newts, a flatworm—the planarian *Tugesia tigrina* (the experiment was designed by eighth-grade student A. M. Morozov) and sprouts of the balsam *Impatiens balsamina* (designed by V. G. Chuchkin, V. B. Ivanov, V. N. Filippenko) were used to study post-traumatic regeneration. Recovery of the root cap (a gravireception organ) as a function of the size of the removed portion was assessed in the balsam. Neither experiment revealed effects from spaceflight factors: Regeneration proceeded normally in flight.

The basic results of the biological experiments aboard the Kosmos-1887 biosatellite are summarized in the table.

Basic Results of Biological Experiments Aboard the Kosmos-1887 Biosatellite

Biological Specimens	Indicator	Effect of Spaceflight	Principal Authors
Lysogenic intestinal bacillus culture	Induction of moderated λ phage	Threefold increase ($p < 0.01$)	S. V. Komarov, M. P. Bragina
	Survival of bacteria	0	
Tetrahymena	Cell proliferation	Acceleration ($p < 0.05$)	M. G. Taiybekov, I. B. Raykov
	Cell volume	0	
	Cell shape	More spherical	
	DNA content	0	
	Protein content	Decrease ($p < 0.05$)	
Chlorella (autotrophic culture)	Quantity of autospores	Increase	G. I. Meleshko

Basic Results of Biological Experiments Aboard the Kosmos-1887 Biosatellite (Continued)

Biological Specimens	Indicator	Effect of Spaceflight	Principal Authors
	Biomass increment	0	
Wolffia	Growth	Stimulation	V. M. Abramova
	Aging	Acceleration	
Haplopappus (cell culture)	Lipid peroxidation	Increase	Ye. L. Kordyum
	Cell ultrastructure	0	
Oocytes:			
Drosophila	Ploidy of nuclei	0	A. A. Neyfakh
Guppy	Development of new generation	0	
Newts	Size of oocytes	Increase	L. V. Belousov, N. L. Delone
	Quantity and size of nucleoli	Increase	
Drosophila females	Frequency of meiotic crossing-over	More or less depending on locus	A. V. Smirnova
Eggs of walking stick	Embryonic development	0	Yu. A. Zakhvatkin, Kh. Byuker
	Larval hatching	Elevated mortality, abnormalities	
Guppies (fry)	Embryonic development	0	L. R. Palmbakh
	Vestibular apparatus	0	
	Swim bladder	Not filled with air	
Darkling beetles	Period of free-running circadian rhythm	Reduction ($p < 0.005$)	A. M. Alpatov, V. B. Chernyshev
Balsam (sprouts)	Regeneration of root cap	0	V. G. Chuchkin, V. B. Ivanov
Planarians	Body regeneration	0	A. M. Morozov
Newts	Regeneration of limbs and lenses	Inflight, 0; afer 2 weeks, acceleration	V. I. Mitashov
Monkey lymphocytes	Sister chromatid exchanges	Negligible increase	N. L. Delone, S. M. Kuzin
	Number of nucleoli	Increase	

Further research planned for future biosatellites will have a common goal—identifying the biological role of weightlessness as an ecological factor, and evaluating the extent and nature of its action (damaging, modifying, stimulating, facilitating) on different levels of organization of life. Practical results of the research will consist of a determination conclusion as to how suitable and necessary protection against weightless (creation of artificial gravity) would be in a long flight, plus recommendations on the development of preventive methods and substantiation of the principles for selecting the species composition of future cosmic ecosystems.

The research will be conducted at the cellular, individual, and population levels. The objectives in cell biology are to find gravity-dependent processes in the cell and nonspecific gravity sensors, to identify adaptive changes in the cell in response to weightlessness, and to study their mechanisms and biological "significance." The goals at the level of the entire body are to assess the nonspecific action of weightlessness, to clarify the relationship of the effect of weightlessness and linear dimensions (body weight) and ecology of the body, and to study change in the biological needs of an organism living for a long period of time—as long as several generations—in weightless conditions. Population studies should help us identify the direction and rate of microevolution in response to weightlessness as a factor of natural selection.

Bibliography

1. Gazenko, O. G. and Parfenov, G. P., KOSMICHESKAYA BIOL., Vol 1, No 5, 1967, pp 12-16.

2. Delone, N. L., Popovich, P. R. and Antipov, V. V., KOSMICHESKIYE ISSLED., Vol 1, No 2, 1963, pp 312-325.

3. Delone, N. L. and Antipov, V. V., KOSMICHESKAYA BIOL., Vol 22, No 3, 1988, pp 4-15.

4. Zhukov-Verezhnikov, N. N. et al., KOSMICHESKIYE ISSLED., Vol 6, No 1, 1968, pp 144-149.

5. Ilin, Ye. A. and Parfenov, G. P., "Biologicheskiye issledovaniya na biosputnikakh 'Kosmos'" [Biological Research Aboard Kosmos Biosatellites], Moscow, 1979, pp 220-227.

6. Klimovitskiy, V. Ya., Alpatov, A. M. et al., KOSMICHESKAYA BIOL., Vol 21, No 5, 1987, pp 14-18.

7. Parfenov, G. P., "Osnovy kosmicheskoy biologii i meditsiny" [Principles of Space Biology and Medicine], Moscow, Vol 2, Book 2, 1975, pp 306-337.

8. Sushkov, F. V. and Rudneva, S. V., "Biologicheskiye issledovaniya na biosputnikakh 'Kosmos'," Moscow, 1979, pp 199-213.

9. Tairbekov, M. G. and Parfenov, G. P., USPEKHI SOVREM. BIOL., Vol 96, No 6, 1983, pp 426-434.

10. Bucker, H. et al., ADVANC. SPACE RES., Vol 6, No 12, 1986, pp 115-124.

11. Cogoli, A. et al., SCIENCE, Vol 225, No 4658, 1984, pp 228-230.

12. Egorov, B. B., Delone, N. L. and Antipov, V. V., PHYSIOLOGIST, Vol 32, No 1, Suppl., 1988, pp 556-960.

13. Fuller, C. A., Ibid., Vol 27, No 6, Suppl., 1984, pp 93-94.

14. Mergenhagen, D., NATURWISSENSCHAFTERN, Vol 73, No 7, 1986, pp 410-412.

15. Mesland, D., "Microgravity Research," Utrecht, 1984, pp 119-133.

16. Mitashov, V. I. et al, "European Symposium on Life Scientific Research in Space, 3rd," Graz, 1987, pp 299-303.

17. Nace, G. W., ADVANC. SPACE RES., Vol 3, No 9, 1983, pp 159-168.

18. Planel, H. et al., ADVANC. SPACE RES., Vol 1, No 3, 1981, pp 95-100.

19. Richoilley, G. et al, "Biorack on Spacelab D1," Paris, 1988, pp 69-73.

20. Sparrow, A. N. et al, RADIAT. RES., Vol 35, No 2, 1968, pp 501-518.

21. Sulzman, F. et al, SCIENCE, Vol 225, No 4658, 1984, pp 232-234.

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Formation of Wheat Microbial Cenosis in Manned Spacecraft

907C0422B Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 5, Sep-Oct 89 pp 39-43

[Article by N. A. Drugova, L. S. Chernova and A. L. Mashinskiy]

[Text] One of the important ecological problems of the present stage of the efforts to create human life-support systems that include biological objects is that of identifying the laws governing the formation of a microbial community on higher plants. That is necessary not only for normal functioning of the plant-substrate-microflora complex, but also for the formation of a human habitat in a sealed space. That is why it is so important to study microbial cenoses of higher plants when devising space greenhouses.

Research on the mutual relationships between macro- and microorganisms[4,6,7] has shown that normal autoflora of man and plants protects them from by foreign organisms. The specific conditions of manned spacecraft can lower the defenses of living organisms. Experimental data have confirmed that limiting the species composition of the microflora in the environment of sealed habitats leads to impoverishment of man's own microflora and, as a consequence, to diminution of the body's immune response.[1] That means that the presence of space greenhouses containing higher plants may be a positive factor stabilizing the microbial environment of a sealed habitat, inasmuch as the quantitative and qualitative composition of microflora associated with plants is rich and diverse.[6]

It is also absolutely necessary to study the influence that the microbial complex of biological objects, man, and a sealed habitat have on each other in a manned spacecraft. Finding possible methods of regulating the active development of species of microorganisms whose accumulation in a greenhouse may be an unfavorable factor for man and plants will also be mandatory in future research associated with the laws governing the formation of microbial cenoses of plants.

We have found any papers that have studied microflora accompanying higher plants in conditions of manned spaceflight, nor have we been able to find any references to them. The goal of this experiment was to study the microbial cenosis of the phyllosphere and rhizosphere of wheat plants growing for a certain period in a manned spacecraft.

Procedures

The Svetoblok-M plant-growing chamber, which possessed a water supply and mineral nutrition system, shared the atmosphere of the habitat. The mineral nutrition system included an artificial ion-exchange substrate in a tissue form containing the following quantities of mineral elements, in moles per kilogram: potassium, 0.30; calcium and magnesium, 1.46; iron (II), 0.015; iron (III), 0.01; nitrates, 0.03; phosphates, 0.09; sulfates, 0.375. In addition to those elements, the substrate contained manganese, copper, zinc, cobalt, nickel, boron and molybdenum ions. A light fixture provided 9.5-30 W/sq m of photosynthetically active radiation, depending on plant height. Around-the-clock illumination was provided.

Sterile seeds from Eritrosperum-841 wheat plants treated with tetramethylthiuram disulfide (TMTD) were placed in a dry substrate in the Svetoblok-M vegetation

unit. The substrate was not moistened until it was aboard the spacecraft. A synchronous experiment using the same kind of unit, but without the influence of the anthropogenic factor, was conducted on the ground. That experiment served as the control.

Microbiological samples of plant materials and washes from the interior surface of the vegetation unit were taken on the 19th day of plant growth, in the third-leaf phase. Samples were taken in special sterile test tubes, and aseptic rules were observed.

Washes from the interior surface of the unit, taken in correspondence with methods commonly accepted in sanitary microbiology, and washes from leaves and rhizosphere served as the starting material for the microbiological research. Those washes were obtained by vigorously stirring suspensions of the plant material with a magnetic agitator (1,400 rpm) for 10 min in sterile tap water.

Koch's dish method was used to determine the total number of microorganisms. Beef extract agar was used as the nutrient medium for heterotrophs. Plant autoflora were isolated on nutrient agar. Elective media were used to study specific groups of microorganisms: actinomycetes were checked on starch-ammonia agar, fungi were determined on acidified Chapek's medium, oligonitrophils were determined on unconcentrated Ashby medium, and intestinal bacillus group bacteria (IBGB) were determined on Endo medium. The following functional groups of microorganisms were subjected to group analysis using the maximum dilutions method: ammonifiers were identified on beef broth, denitrifiers were isolated on Giltey's medium, cellulosolytic microorganisms were identified on Voznyakovskaya's medium, and nitrifiers were determined on Vinogradskiy's medium. Quantitative analysis of the first three groups of microorganisms was conducted 5-7 days after inoculation, and nitrifiers were determined after three weeks. The number of microorganisms was subsequently calculated using McCready's table. Identification of isolated pure cultures of microorganisms included study of the morphological, physiological and biochemical characteristics and determination of the genus or species of bacteria using Bergey's key.[10] The experimental data were subjected to statistical treatment with methods commonly accepted in microbiology.[5]

Results and Discussion

Investigations of the microbial community of higher plants in a manned spacecraft were preceded by studies on the ground, first done by Tirranen,[8] of microflora of plants grown in ecosystems characterized by varying degrees of communication with the outside environment.

Observation of wheat microflora grown in a phytotron that shared an atmosphere with animals (rats) and that contained a nutrient solution to which mineralized products of human vital activities were added made it possible to note change in the microbial complex, the appearance of conditionally pathogenic bacteria and an increase in overall qunatity of microorganisms, primarily as a result of sporogenic forms and fungi.[3] Investigation of wheat plant microflora that made up the photo-autotrophic component of a model of a biological human life-support system showed that the composition of the microbial ecosystem is represented by the same genera of bacteria, regardless of whether higher plants are cultivated in autonomy and whether they are part of biological life-support systems. Representatives of the intestinal bacillus group, which appear later on, were isolated irregularly, which indicates that development of those species was suppressed by microflora typically accompanying plants.[9]

The experiment described here, conducted in order to study wheat microflora in the conditions of a manned spacecraft, represents the next stage in research on the laws governing the formation of the microbial community of higher plants in closed ecosystems.

Determination of the microbial levels of the wheat phyllosphere showed that in a manned spacecraft, the quantity of bacteria is higher; moreover, representatives of the intestinal bacillus group were isolated (Table 1). Among the analyzed physiological groups of microorganisms participating in transformations of nitrogen-containing substances, the ammonifier group—bacteria capable of using protein and other organic nitrogen compounds as a nitrogen source—were predominate among the wheat plants just as they were among other higher plants studied previously.[2,3,9] The population of oligonitrophils, denitrifiers and ammonifiers in the experimental version exceeded that of the control, which is apparently due to certain changes in plant development in a manned spacecraft; the plants differed markedly from those in the ground-based version.

Table 1. Microflora of the Wheat Phyllosphere (Number of Microbial Bodies Per Gram Dry Weight)

Microorganisms	Experiment	Control
Total bacterial population of above-ground portion of plants	(1.09 +/- 0.01) x 10^8	(6.65 +/-0.33) x 10^7
Plant autoflora	(5.45 +/- 0.10) x 10^7	(3.43 +/-0.20) x 10^4
Fungi	(1.05 +/- 0.02) x 10^5	(1.02 +/-0.02) x 10^3
Actinomycetes	nd	nd
Oligonitrophils	(1.78 +/- 0.18) x 10^6	(2.66 +/-0.09) x 10^4
Denitrifiers	(2.27 +/- 0.05) x 10^6	nd
Ammonifiers	(5.44 +/- 0.07) x 10^9	(1.22 +/-0.04) x 10^4
IBGB	(3.40 +/- 0.18) x 10^2	nd Note: Here and in tables 2 and 3, "nd" means "not detected."

It is evident from the results of studying rhizosphere microflora (Table 2) that the bacterial population of the plant rhizosphere is at the same level in experiment and

in control; however, the population of fungi and cellulosolytic bacteria in the experiment exceeds that of the control by several orders of magnitude. The higher levels of cellulosolytic bacteria and fungi in experiment may be an indirect indicator of intensified use of cellulose as a substrate. Bacteria of the intestinal bacillus group developed in the experimental version only, and actinomycetes developed in the control only.

Table 2. Microflora of Wheat Rhizosphere (Number of Microbial Bodies Per Gram Dry Weight)

Microorganisms	Experiment	Control
Total bacterial population of rhizosphere	(5.07 +/-0.08) x 10^9	(2.24 +/- 0.05) x 10^9
Plant autoflora	(2.44 +/- 0.04) x 10^9	(3.58 +/-0.14) x 10^8
Fungi	(6.73 +/- 0.04) x 10^6	(5.89 +/-0.18) x 10^5
Actinomycetes	nd	(1.91 +/- 0.01) x 10^4
Oligonitrophils	(3.98 +/- 0.02) x 10^8	(7.17 +/-0.10) x 10^9
Denitrifiers	(4.40 +/- 0.07) x 10^8	(7.18 +/-0.09) x 10^8
Ammonifiers	(2.20 +/- 0.05) x 10^5	(6.22 +/-0.08) x 10^9
Cellulosolytics	(4.01 +/0 0.18) x ^{5}	(2.87 +/-0.53) x 10^2
Nitrifiers	nd	nd
IBGB	(8.14 +/- 0.29) x 10^4	nd

Determination of the population on the interior surface of the Svetoblok-M device (Table 3) showed that the quantity of fungi is somewhat larger in flight and that IBGB were not detected.

Table 3. Microflora of the Interior Surface of the Svetoblok-M Unit (Number of Cells Per 100 sq cm)

Microorganisms	Experiment	Control
Bacteria	(9.64 +/0 0.11) x 10^3	(3.56 +/-0.42) x 10^3
Fungi	(9.05 +/- 0.08) x 10^3	(1.74 +/-0/06) x 10^3
IBGB	nd	nd

Identification of the isolated pure bacterial cultures demonstrated a relatively high degree of similarity between the bacterial communities of the experimental and control versions. Sorensen's coefficient of similarity of bacterial communities, calculated with the formula $S=2c/(a+b)$, where a and b are the number of species in each version and c is the number of species encountered in both versions, was close to unity.

Presence of *Pseudomonas chlororaphis, Ps. acidovorans, Arthrobacter globiformis, Arth. citreus, Ps. fluorescens, Agrobacterium radiobacter, Ps. aureofaciens,* and *Acinetobacter* sp. was noted in the rhizosphere irrespective of the conditions under which wheat plants were grown, with *Ps. chlororaphis* being the predominate species.

Spore bacteria of genus *Bacillus, Aeromonas* sp., *Acetobacter aceti, Ps. putida,* and *Aerococcus* sp. appeared in the conditions of spaceflight; flavobacteria disappeared in such conditions. Development of spore forms of bacteria in the rhizosphere, in addition to putrefactive bacteria and aerobic cellulosolytics, may be evidence of the beginning of destruction of the plant root system.

The bacterial landscape of the wheat phyllosphere is represented by *Erwinia herbicola, Ps. acidovorans, Nocardia restricta, N. rugosa, N. rubra, Arth. globiformis, Ps.* sp., *Ps. chlororaphis, Mycobacterium phlei,* and *Lactobacillus plantarum.*

Those same forms were also detected on the inside of the vegetation unit in condensate consisting of transpiration water. The phyllosphere was dominated by *Nocardia* and an epiphyte—*E. herbicola*; that species also predominated in the control condensate; in the experimental version, *Pseudomonas* sp. dominated in condensate. Besides the enumerated species, bacteria of genera *Acinetobacter, Aerococcus,* and *Serratia marcescens* were detected in experiment.

Cultivation of wheat in space flight conditions led not only to an increase of the population of mycoflora, but also to diversification of its forms. For example, if the ground version demonstrated primarily fungi of genera *Aspergillus* and *Penicillium* developed in the phyllosphere and *Aspergillus, Penicillium, Cladosporium* and *Stemphylium* in the rhizosphere, then the flight version demonstrated the development of fungi of genus *Cladosporium* on wheat leaves and fungi of genera *Mucor, Cephalosporium,* and *Verticillium* in the root zone.

Thus, the research results showed that the microbial community of plants developing in the initial period of vegetation in a manned spacecraft comes about in response to the influence of the anthropogenic factor, which id effected when the substrate and the plants share the air of the inhabited space. The community is distinguished by higher bacterial and fungal population in the phyllosphere and a lower population in the plant rhizosphere, by the presence of representatives of the intestinal bacillus group, and by an increase in the number of cellulosolytic bacteria.

However, it would be premature to make a categorical conclusion concerning the significance of changes in the microbial community of wheat plants in this experiment. Research on the microflora of higher plants in the conditions of a manned spacecraft will be continued.

Bibliography

1. Gazenko, O. G., Pestov, I. D. and Makarov, V. I., "Chelovechestvo i kosmos" [Mankind and Space], Moscow, 1987.

2. Drugova, N. A. and Yunusova, L. S., "Aktualnyye problemy kosmicheskoy biologii i meditsiny" [Urgent Problems of Space Biology and Medicine], Moscow, 1972, pp 58-59.

3. Drugova, N. A. and Yunusova, L. S., "Rol nizshikh organizmov v krugovorote veshchestv v zamknutykh ekologicheskikh sistemakh" [The Role of Lower Organisms in the Recycling of Matter in Closed Ecosystems], Kiev, 1979, pp 252-257.

4. Zaloguyev, S. N., Viktorov, A. N., Gorshkov, V. P. and Novikova, N. D., "Rezultaty meditsinskikh issledovaniy vypolnennykh na orbitalnom nauchno-issledovatelskom komplekse 'Salyut-6'—'Soyuz'" [Results of Medical Research Carried Out Aboard the Orbiting Scientific Research Complex Salyut-6/Soyuz], Moscow, 1986, pp 43-46.

5. "Metody obshchey bakteriologii" [Methods of General Bacteriology], Translated from English, Moscow, Vol 1-3, 1983.

6. Mishustin, Ye. N. and Yemtsev, V. T., "Mikrobiologiya" [Microbiology], Moscow, 1970.

7. "Problemy kosmicheskoy biologii. T. 28. Eksperimentalnyye ekologicheskiye sistemy, vklyuchayushchiye cheloveka" [Problems of Space Biology. Vol 28. Experimental Ecosystems Including Man], Moscow, 1975.

8. Tirranen, L. S., "Formation of Microflora of the Higher Plant Unit of a Closed Ecosystem," Abstract of a dissertation in pursuit of the academic degree of candidate of biological sciences, Leningrad, 1975.

9. Yunusova, L. S., Kondratyeva, Ye. M. and Drugova, N. A., in "Vsesoyuznoye rabocheye soveshchaniye po voprosu krugovorota veshchestv v zamknutykh sistemakh na osnove zhiznedeyatelnosti nizkikh organizmov, 11-ye: Materialy" [All-Union Working Conference on the Problem of Recycling of Matter in Closed Systems on the Basis of Vital Activities of Lower Organisms, 11th: Proceedings], Kiev, 1983, pp 173-175.

10. Buchanan, R. E. and Gibbons, N. E. (Editors), "Bergey's Manual of Determinative Bacteriology," 8th edition, Baltimore, 1974.

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